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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

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Front cover: Worldwide industrialization has caused an increase in the number of chemical, physical and biological agents to which humans are exposed. (*Photo courtesy ILO.*)

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Editorial

Definition of a deadline

When I first started as editor of *Chemistry International* (April 1985 — although it now seems many years ago!) the following joke was circulating in IUPAC circles.

Joker: What is a deadline?
Listener: I don't know.
Joker: A deadline is when you actually start working on something!

Now, as any bureaucrat will tell you, work in a modern office means two things and two things only: (1) meeting deadlines, and (2) getting other people to meet deadlines. Since deadlines would seem to provide the underlying structure of work — at least in IUPAC — I suggest that IUPAC establishes a Committee on Deadlines. A number of tasks and questions to be tackled by this committee immediately spring to mind:

(a) Does a deadline refer to when you finish the work, despatch the work or deliver the work?
(b) Can a deadline fall on a weekend? But then what is a weekend? In Moslem countries a weekend is Thursday and Friday and in other places that I know it would seem to start on a Wednesday and finish on a Tuesday!
(c) A distinction would need to be made between absolute deadlines and relative deadlines. An absolute deadline falls on a day in the Gregorian calendar. A relative deadline is measured in units of hours, days, weeks and months and usually prefixed by the words 'before' or 'after' as in, "The typescript should be delivered at least one month *before* the conference."
(d) Finally the Committee might recommend (insist?) that in all IUPAC business and publications the International Organization for Standardization (ISO) agreed format for writing deadlines is used. A point of explanation — when I started work at the IUPAC Secretariat I was surprised to note that our Executive Secretary, Dr Williams, almost invariably wrote his dates "back to front". For example, I am writing this editorial on 15 October 1986. Many Americans write this as October 15th, 1986. However Dr Williams uses 86.10.15 — which is the ISO standard way of writing dates.

Many jokes contain elements of truth and seriousness and this is the case with the joke above. A deadline relates to a transfer of work and responsibility from one person to another. It is the date when someone delivers (or should deliver) a piece of work and someone else starts (or should start) on it.

The editor of any magazine has to meet deadlines. For *CI* the most important of these are the "copy dates". These are the absolute deadlines when I have to hand over "copy" to the publisher who can then start work on production of the issue. The following are the copy dates for the six issues of *CI*, Vol. 9:

CI *Issue*	*Copy date*
No. 1 (January 1987)	86.10.22
No. 2 (March 1987)	86.12.01
No. 3 (May 1987)	87.02.10
No. 4 (July 1987)	87.04.07
No. 5 (September 1987)	87.06.12
No. 6 (November 1987)	87.08.13

These are absolute deadlines determined by the publisher after consultation with the editor. The editor now has to impose relative deadlines on authors. These vary depending on the nature of the article or report. For a feature article the editor might require the typescript to be delivered at least two months *before* the copy date. The two months are needed for reviewing, editing, and obtaining photographs and permissions. For most items one month is sufficient although, even then, this does mean a delay of *at least* four months between receipt of typescript and publication.

Unfortunately, and here I make a general apology to some authors, meeting deadlines does not guarantee publication in a particular issue. The flux of material in and out of the editor's office varies immensely and there are times when far too much material arrives for publication in one issue — the editor has to work within a very strict contractual page budget (240 pages per annum). This problem particularly applies to regular items such as 'Commission and Committee News'. In this case, publication of some items has to be deferred to subsequent issues. It is perhaps worth pointing out that at their meeting in New Delhi, March 1986, "the Officers favoured a ruthless editorial limitation to the present number of pages rather than agree to increase the annual page budget (and hence the subscription, particularly to Affiliates)".

The copy dates also throw up some strange anomalies. For example, the copy dates for the

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Opinions expressed here are those of the author and do not necessarily reflect the views or policy of IUPAC.

September and November 1987 issues of *CI* fall well before the next IUPAC General Assembly, which is to be held in Boston, August 1987. Thus, the first reports from the Boston General Assembly will not appear in *CI* until the January 1988 issue! (And we call it a news magazine?)

The final word on deadlines should perhaps go to the prolific and popular English novelist Anthony Trollope (1815–82) who wrote in his autobiography:

> "The punctual who keep none waiting for them, are doomed to wait perpetually for the unpunctual. But these earthly sufferers know that they are making their way heavenwards — and their oppressors their way elsewhere. If the former reflection does not suffice for consolation, the deficiency is made up by the second."

News & Views

CHEMRAWN II seminars

Major aspects of food production and consumption in the sub-equatorial region of South America were discussed at a three-day seminar in Buenos Aires, Argentina, 28–30 May 1986. The seminar was one of a series inspired by CHEMRAWN II (see *CI*, Vol. 7, No. 4, p. 21, 1985) which was held in Manila, Philippines in December 1983. CHEMRAWN is an acronym for Chemical Research Applied to World Needs (see *CI*, Vol. 8, No. 3, p. 11, 1986).

The next seminar in the series planned by the CHEMRAWN Committee will take place in Nairobi, Kenya, March 1987. The seminar is entitled "The Role of Chemistry in Improving Food Supplies in Africa".

Steroid Reference Collection

The Steroid Reference Collection, which is maintained by the UK Medical Research Council and the US National Institutes of Health, provides milligram or microgram samples of reference steroids for use in clinical or biochemical studies, including the development and standardization of micro-assays, chromatography and mass spectrometry. The Collection also offers advice on chemical problems involving steroids, and an NMR service (^{1}H and ^{13}C) for the identification of steroids.

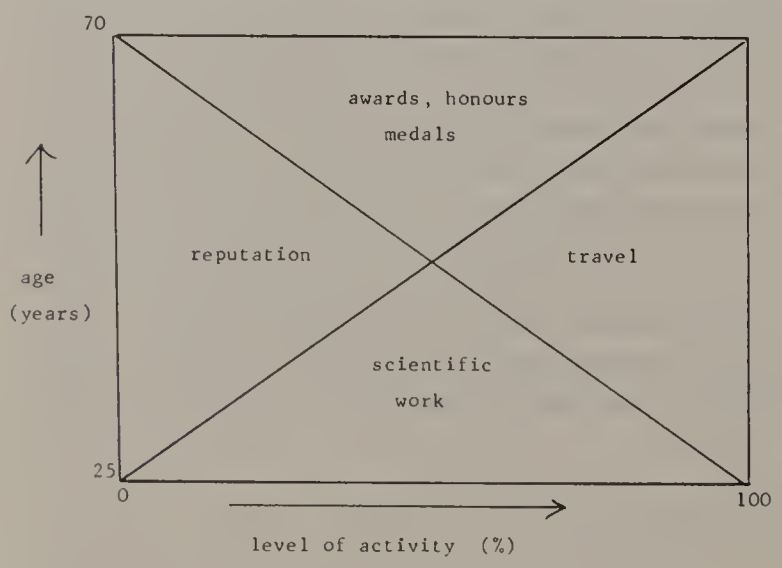
The Collection now comprises over 4000 steroids, many of them donated by individual scientists or by the pharmaceutical industry. They include the steroid hormones and their metabolites, sterols, bile acids, synthetic analogues, and miscellaneous natural products related to steroids.

A recent grant from the Medical Research Council provides for the Collection to continue until the year 1990, but with the requirement that users will in future be required to pay a 'handling charge' of £5 sterling per sample issued, to help towards the cost of the service. Users in the USA are at present exempted from this charge.

Enquiries, requests for information, lists of available steroids, or offers of samples for the Collection, should be addressed to: Professor D. N. Kirk, Curator of the Steroid Reference Collection, Department of Chemistry, Queen Mary College, Mile End Road, London E1 4NS, England.

Workers in the USA are asked to address enquiries or requests to: Dr David F. Johnson, Building 4, Room 141, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases, National Institutes of Health, Bethesda, Maryland, 20205 USA.

Career diagram of a scientist?



Interactions between pairs of trace elements

The 6th UOEH International Symposium and 3rd COMTOX on Bio- and Toxico-kinetics of Metals was held at the University of Occupational and Environmental Health (UOEH), Kitakyushu, Japan, 27–31 July 1986. UOEH was founded in 1978 by the Japanese Ministry of Labour to train up specialist medical and para-medical personnel to recognize

and tackle acute and chronic effects on health caused by exposures to harmful chemicals.

Like the two previous COMTOX Symposia (Monte Carlo, 1977 and Montreal, 1982) this meeting was valuable in that it brought together scientists and physicians from a wide variety of disciplines to present many different aspects of the toxicology of trace metals. A recurring theme, likely to become increasingly important, was that of interactions between pairs of trace elments — both protective and antagonistic.

Just a second

Before 1958, one second was defined as 1/86 400 of the mean solar day. Between 1956 and 1967 the ephemeris second was used. This is exactly 1/31 556 925.9747 of the tropical year at $00^h\ 00^m\ 00^s$ on 31 December 1899. The second is now defined as the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the $^{133}_{55}Cs$ atom.

Letter to the Editor

Silver nitrate–ethanol: EXPLOSION

Sir,

Prof. N. M. Doherty (University of Washington) drew our attention to a serious explosion in her laboratory during the purification of silver nitrate using the procedure in our book on the "Purification of Laboratory Chemicals", 2nd Edn, p. 520, Pergamon Press, Oxford, 1980. The following is quoted from her letter:

> "As per your procedure the student was recrystallizing silver nitrate (20 g) from high purity (quartz-distilled, deionized) water (~100 mL) by the dropwise addition of high purity ethanol (~1 mL total). After collection of a first crop of crystals (~7 g), the student, following normal crystallization procedures, produced a second crop of crystals by concentration of the mother liquor by heating on a steam bath, then dropwise addition of another ~1 mL of ethanol. A contact explosion occurred during collection of the second crop when the student agitated the slurry on a sintered glass frit with a spatula. This explosion was quite violent, shattering the glassware involved and sending large chunks of glass as far as fifteen feet away. Very fortunately, the student was not cut by any of the glass shards, however, the potential for major personal injury was present."

We were unaware of this danger, but explosions from silver nitrate and ethanol were known to occur and the hazards have been documented: J. P. Tully, *News Ed. (Am. Chem. Soc.)*, Vol. 19, p. 250 (1941), *Chem. Abstr.*, Vol. 35, p. 3092[8] (1941); D. L. Garin & K. O. Henderson, *J. Chem. Educ.*, Vol. 47, p. 741 (1970); "Handbook of Reactive Chemical Hazards" by L. Bretheric, 3rd Edn, pp. 13–14 Butterworths, London, 1985.

We are grateful to Prof. Doherty for pointing out the dangers of this purification to us and we should like to inform the chemical community of this grave error in our book. This will be rectified in the third edition.

D. D. Perrin
W. L. F. Armarego
D. R. Perrin

John Curtin School of Medical Research
The Australian National University
Canberra, ACT
Australia

IUPAC people

New Chairman of Soviet National Committee

The National Committee of Soviet Chemists appointed a new Chairman at its 1986 meeting. He is Prof. Alexandre Fokin. Fokin, born 1912, is a full member of the USSR Academy of Sciences, Lenin Prize winner and Director of the Institute of Organoelemental Compounds named after A. N. Nesmeyanov, Academy of Sciences of USSR.

During his distinguished career he has specialized in organic, organoelemental and applied chemistry and is the author of more than 100 papers and co-author of over 400 scientific works and inventions, including 4 monographs. Fokin has carried out fundamental research on the chemistry of fluoroolefins which have led to the synthesis of many new substances including biologically active compounds used in medicines and pesticides. He has also worked on methods for the utilization of radioactive wastes, radiation-induced polymerization of fluoroolefins and the chemistry of alkylenesulphides. Many of his results have been successfully applied in industry.

Fokin is a member of the Presidium of the USSR

Prof. A. V. Fokin (right) after the 1986 meeting of the National Committee of Soviet Chemists. From left to right: Dr G. Loginov (Secretary of the General and Technical Division) and Profs. L. V. Gurvich, G. B. Bokij and V. A. Koptyug (IUPAC Vice-President).

Academy of Sciences, Academician-Secretary of the General and Technical Chemistry Division of the USSR Academy of Sciences and President of the All-Union Mendeleev Chemical Society.

Bull elected President of SACI

Dr Jim Bull has been elected to serve as President of the South African Chemical Institute (SACI) for 1986/87. He assumed office at the Annual General Meeting of the Institute on 11 July 1986. Bull represents the Institute on the National IUPAC Committee and is an Associate Member of the Commission on the Nomenclature of Organic Chemistry. He is also Regional Representative for dissemination of provisional recommendations (see *CI*, Vol. 8, No. 3, p. 28, 1986).

Dr Jim Bull at the IUPAC Congress held in Manchester, UK, September 1985.

Pesticide award

Junshi Miyamoto, who was a member of the Commission on Pesticide Chemistry and a member of the Organizing Committee of the 5th International Congress of Pesticide Chemistry held in Kyoto in 1982, was the 1986 winner of the Burdick & Jackson International Award for Research in Pesticide Chemistry. The award is sponsored by the Division of Agrochemicals American Chemical Society.

Miyamoto received the award in recognition of his pioneering research in the use of labelled pesticides in metabolism and degradation studies. His research on the environmental chemistry of fenitrothion is considered a landmark in pesticide chemistry. Miyamoto has also worked on the environmental fate and metabolism of the recently developed pyrethroid insecticides and demonstrated their safety in a large number of environmental studies.

Heads down at the meeting of the Interdivisional Committee on Nomenclature and Symbols (IDCNS) which took place at Witney, near Oxford, UK, 31 August–1 September last year. IDCNS Secretary Dr Bob Fox (left) studies the latest issue of *Pure and Applied Chemistry* (*PAC*) whilst Chairman Dr Kurt Loening ploughs through a mountain of paper.

Address changes

Dr J. Järvisalo (Secretary, Clinical Chemistry Division): The SII Rehabilitation Research Centre, Peltolantie 3, SF-20720 Turku, Finland.

Prof. J. Michl (Chairman, Commission of Photochemistry): Department of Chemistry, University of Texas at Austin, Austin, TX 78712-1167, USA.

Two old friends of mine

The following oration was made by Prof. D. Thorburn Burns at the presentation of the Third Robert Boyle Gold Medal for Analytical Chemistry of the Analytical Division of the Royal Society of Chemistry (RSC) to Prof. E. Pungor on 24 July 1986 at the SAC 86/3rd BNASS Conference Banquet held in the Council House, Bristol, UK.*

It gives me great pleasure to talk, albeit briefly, about two old friends of mine and, as tradition now dictates, to show the links and appropriateness of the award of the Robert Boyle Gold Medal, to its current recipient.

The first old friend is Robert Boyle himself with whom, at least with his writings and artefacts, I have spent many happy and fruitful hours, the second happily here present is Prof. Erno Pungor with whom I have also spent much time particularly via the Federation of European Chemical Societies Working Party on Analytical Chemistry, of which he is the current Chairman.

On previous Boyle Medal presentation occasions, Boyle's life, background, specific contributions to analytical chemistry, links with America and Holland were reviewed. On this occasion it is appropriate to outline Boyle's interest in matters Hungarian.

A surprisingly large number of references to Hungarian mines, mineral waters, chemicals and chemical trade are spread throughout Boyle's writings, about 50 in all, from the *Sceptical Chemist* onwards.

The material was gathered by Boyle from visitors, correspondents and books of the period since he did not visit Hungary. This acquisition of material on Hungary was in no way accidental for Boyle had in 1666 set up in *Phil. Trans.* a reporting protocol of "information to compose a good natural history". 101 enquiries were concerning mines and a set of 21 queries were specifically directed at Hungary and Transylvania. In due course replies came in and appeared in *Phil. Trans.* of the Royal Society. Boyle used this and the other material and refers in detail many times to the mines near Cremnitz, vines growing near the mines and comments on the wine itself: Boyle said "Tokay (a place that affords the famousest wine of Hungary indeed the best I have drunk)". This comment would have been endorsed by the late Prof. R. Belcher in whose presidency the idea of the Robert Boyle Gold Medal was developed.

Appropriate to an electroanalytical chemist is the couplet in E. Brown's report on the mines at Herrn-Ground where copper was produced by the electrochemical displacement reaction with iron. The couplet was engraved on a gilded copper vessel with a piece of native silver attached. The couplet reads:

Eisen ware Ich, Kupfer bin Ich
Silber trag Ich, Gold bedeckt mich.

i.e. Copper I am, Iron was of old
Silver I carry, covered am with Gold

*See *CI*, Vol. 7, No. 5, p. 42, 1985. The initials SAC stand for the former Society of Analytical Chemistry and BNASS for the Biennial National Atomic Spectroscopy Symposium.

Mr D. C. M. Squirrell, President of the RSC Analytical Division presents the Third Robert Boyle Gold Medal to Prof. Erno Pungor. Prof. Pungor has been active in IUPAC for many years. He is currently Chairman of the Hungarian National Committee and Vice-Chairman of the Commission on Electroanalytical Chemistry (see *CI*, Vol. 7, No. 6, p. 2, 1985).

All products of the one mine. All it needed for completion was the liquid gold of Tokay.

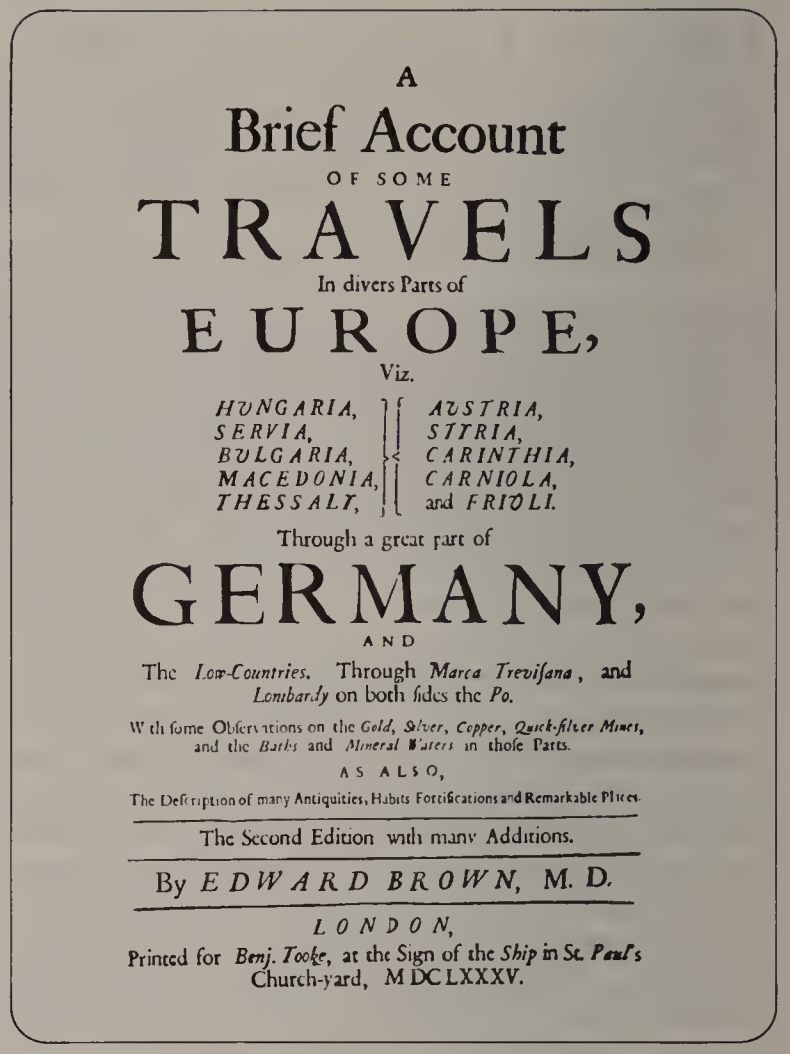
Thus on chemical grounds it is appropriate to present a Robert Boyle Gold Medal to a Hungarian. There are other dimensions and appropriatenesses. Boyle was the first great European analytical chemist and indeed invented the term **chemical analysis** and fully supported the European, indeed the world concept of science, as was stressed by Oldenberg in the 3rd year of *Phil. Trans.* 1666, when he wrote "we may thence take occasion to invite all ingenious men and such as

Prof. D. Thorburn Burns (The Queen's University of Belfast, Northern Ireland) is Secretary of the Commission on Analytical Reactions and Reagents. He has published a series of papers on the historical biography of Robert Boyle: "Robert Boyle (1627–1691): A Foundation Stone of Analytical Chemistry in the British Isles. Part I. Life and Thought; Part II. Literacy Style, Specific Contributions to the Principles and Practice of Analytical Chemical Science; Part III. American and Dutch Connections, and Part IV. Robert Boyle's Determination of Iron in Tunbridge Water: The Earliest Quantitative Colorimetric Reaction?" For Part I, see *Anal. Proc.*, Vol. 19, p. 222, 1982; Part II. *Anal. Proc.*, Vol. 19, p. 288, 1982; Part III, *Anal. Proc.*, Vol. 22, p. 253, 1985; and Part IV, *Anal. Proc.*, Vol. 23, p. 75, 1986.

consider the importance of cementing philosophical spirits, and of assembling together ingenuities, observations, experiments and inventions scattered up and down in the world". We carry out this concept today in the Euroanalysis and in the SAC series, of conferences, gathered here as we are in Bristol for SAC 86. Today's medal recipient is a great European analytical chemist, his publication list contains over 250 substantive papers. He started research with Prof. Shulek on indicators, a topic beloved of R. Boyle, and has worked on aspects of atomic spectroscopy separation science, H.F. titrations, ion selective electrodes, flow systems and chemometrics. He has been widely honoured in his own country with 12 awards and abroad with 8 awards and honorary membership, and he is on the boards of 12 learned journals.

Prof. Erno Pungor is currently head of the Institute of General and Analytical Chemistry at the Technical University of Budapest. Previously he was at Veszprem. He is a Full Academician of the Hungarian Academy of Sciences.

Mr President it is my privilege and pleasure to present to you, and this Assembly, Prof. Erno Pungor, as a fitting recipient for the Third Robert Boyle Gold Medal.



A

Brief Account

OF SOME

TRAVELS

In divers Parts of

EUROPE,

Viz.

HUNGARIA, SERVIA, BULGARIA, MACEDONIA, THESSALY, AUSTRIA, STYRIA, CARINTHIA, CARNIOLA, and *FRIOLI.*

Through a great part of

GERMANY,

AND

The *Low-Countries.* Through *Marca Trevisana*, and *Lombardy* on both sides the *Po.*

With some Observations on the *Gold, Silver, Copper, Quick-silver Mines,* and the *Baths* and *Mineral Waters* in those Parts.

AS ALSO,

The Description of many Antiquities, Habits Fortifications and Remarkable Places.

The Second Edition with many Additions.

By *EDWARD BROWN*, M. D.

LONDON,

Printed for *Benj. Tooke*, at the Sign of the *Ship* in St. *Paul's* Church-yard, MDCLXXXV.

Title page of E. Brown "Travels in divers parts of Europe . . ." 2nd edition (1685).

Spotlight on ICSP

The International Committee on the Science of Photography (ICSP) was formed in 1962 with the aim of initiating International Congresses on Photographic Science (ICPS). In 1975 ICSP became an Associated Organization of IUPAC. It currently has representatives from 21 countries.

The science of photography

Before 1890, the scientific investigation of the mechanism of the photographic process had been carried out by a handful of scientists in a rather haphazard manner. Hurter and Driffield, however, in their publications of 1890 began a systematic investigation into photographic science which has been taken up by others and continued to the present day.

Companies were set up to manufacture photographic materials in the late 19th century in most industrialized countries, but it was George Eastman who initiated a remarkable change by establishing an industrial research laboratory supporting methods of mass production backed up by international marketing. Now virtually all photographic research in the silver halide process is carried out in industrial laboratories or universities.

Conferences

In 1889 a World Exhibition was held in Paris and the French Ministry of Commerce organized the first International Congress of Photography (and incidentally an International Congress of Celestial Photography). Subjects discussed were those of international interest such as standardization and copyright in photographs. A permanent commission was established and it was agreed to hold the next meeting in Brussels in 1891. This and the following meetings in Paris in 1900 and in Liège in 1905 all concerned themselves with similar topics of international interest.

The fifth congress, held in Brussels in 1910, marked a change of style. Although its scope was that of the whole of photography, experimental results were presented, and with the 1925 congress in Paris the transition to consideration of applied and scientific photography was complete. It is worth noting that no less than 450 participants registered for the eighth International Congress held in Dresden in 1931. The next meeting in 1935 was held in Paris, and was the last of the series of meetings held under the auspices of the Permanent International Commission established in 1889.

After the war, a series of 'ad hoc' meetings of an international character were arranged which concerned

Prof. Herward Pietsch (President) and Chris Roberts (Secretary, left) discuss ICSP matters at a recent meeting of the officers of the committee.

themselves with photographic sensitivity. An exception was the Centenary Conference arranged by the Royal Photographic Society in its centenary year (1953) which once again covered the whole spectrum of photographic interest. Subsequent meetings reverted to the more usual subject of photographic science, and it was at this stage that concern was expressed about the fact that these large international meetings were being held too frequently with little or no international co-ordination.

ICSP

In 1962, Eastman Kodak initiated a meeting between Prof. Berg, Prof. Eggert and photographic scientists from ten countries at Schloss Brestenberg, to discuss the organization of international conferences in photographic science. This activity was supported by many well-known scientists, companies such as Agfa-Gevaert, Ciba-Geigy, Fuji and Polaroid, and by the Academy of Sciences of the USSR. In the previous year, Berg had left the Research Laboratories of Kodak Limited at Harrow (England) and succeeded Eggert as the Director of the Photographic Institute of the Eidgenössische Technische Hochschule at Zürich. It was proposed that an International Committee on the Science of Photography (ICSP) should be established.

Since then the full committee has normally met biennially. Prof. Chibisov (USSR) suggested that the ICSP should be linked with an international body and an important development was the affiliation of the ICSP to IUPAC in 1975. One advantage of such an affiliation was that attendance at conferences in the West by participants from socialist countries was made easier.

Statutes for ICSP were drawn up by the Committee and were approved in 1976. The aims of the Committee are:

- To initiate the organization of International Congresses on Photographic Science every four years by national bodies.
- To maintain a list of future meetings in photographic science to avoid clashes of date and subject matter.

The (part-time) officers of ICSP are a President who is responsible for executing decisions made at ICSP committee meetings and a Secretary who deputizes for the President, maintains records of committee meetings and compiles a list of conferences. The first President was Eggert who held office until 1974 and was then succeeded by Berg, the former Secretary. Prof. Herward Pietsch, the then Secretary, became President in 1984.

Each country can elect two representatives and currently representation is from 21 countries. The last international congress was held at Cambridge, England, in 1982 and the next congress will be at Cologne in September 1986.

An article on the history of the international committee would not be complete without reference to the role played by Berg in its foundation and growth. As a photographic scientist of worldwide reputation, he recognized the importance of establishing links between East and West and the ICSP is a consequence of this recognition. His work with ICSP provides an inspiration to pursue the international activities of the committee in the spirit in which it was conceived.

Chris Roberts

Further information

Further information on ICSP and its work may be obtained from C. J. V. Roberts, Secretary ICSP, Research Division, Kodak Ltd, Headstone Drive, Harrow, Middlesex HA1 4TY, UK.

18th International Chemistry Olympiad

Introduction

International Chemistry Olympiads were initiated by East European countries and have now been held for several years. More than 20 countries from three continents now participate in these Olympiads. The meetings are usually also attended by an observer from Unesco. A permanent secretariat is located at Bratislava, Czechoslovakia.

The 18th Olympiad was held at the Gorlaeus Laboratories, State University Leiden, The Netherlands, 6–14 July 1986. Each country normally sends up to four candidates. They are guided by delegation leaders generally high-school teachers and university professors.

Candidates were allowed 5½ hours for the practical examination.

The Chemistry Olympiads aim to

- stimulate the improvement of chemistry teaching in schools
- stimulate interest in the study of science in general and chemistry in particular
- bring bright young students into contact with recent developments in chemistry and chemical technology
- compare standards of chemical education in various countries
- encourage cooperation and international understanding
- develop friendly relations between participants of different countries.

Selection

Each participating country has its own selection procedure, generally based on open competition between high-school pupils. The final selection usually takes place on the basis of preparatory problems and answers, distributed by the organizing country three months before the actual meeting. The preparatory problems (prepared in English, German, French and Russian) serve to provide an equal basis of background knowledge for the participants. They contain most of the practical and theoretical topics to be covered at the Olympiad. These problems are prepared by a team of authors who are also responsible for the final examinations. Some countries offer the chosen candidates Olympiad training courses ranging from one week to two months.

The Olympiad

The candidates are examined in theoretical and practical chemistry with scores for these being split in the ratio 60/40.

Theoretical chemistry is usually broken down into several topics. In 1986, questions included inorganic, bio-organic, organic, physical chemistry, biochemical and chemical technology problems. The questions were all more or less inspired by environmental, medical or material problems. Candidates had 5 hours to solve these problems.

The practical examination involved dissolving a nickel coin in nitric acid, isolating $Ni(NH_3)_6(NO_3)_2$, converting it into the corresponding dichloride, and determining the purity by performing nickel, chloride and ammonia analyses. The candidates were allowed 5½ hours for this.

Results and awards

The results are marked independently by the authors and delegation leaders. The results are then compared and a final score for each candidate determined. Delegation leaders are only told of the scores of the candidates from their own country. The final results are presented in public at the closing ceremony. In 1986 this ceremony was held in the Hall of Knights in the Houses of Parliament, The Hague. The Deputy Minister of Science and Education awarded 11 gold, 15 silver and 29 bronze medals. The remaining 31 pupils were awarded diplomas.

Different questions were answered with different levels of success by participating countries. The biochemistry question, for example, was answered best by the USA and the UK. Romania achieved good results in organic chemistry, whereas the USSR excelled in bio-organic chemistry. Dutch pupils did well with the technology problems. The Federal Republic of Germany attained the highest scores in inorganic chemistry. The group from the Soviet Union and two Swedish pupils scored highly in the practical examination.

Medals were awarded on the basis of percentage correct answers as follows:

Gold	75–88%
Silver	65–75%
Bronze	50–65%

The winner this year was Alain Verberkmoes from The Netherlands. He was also a participant in 1985 and a 1986 participant in the International Physics Olympiad. In a TV interview, he said he intended to study mathematics.

The other 10 gold medals were awarded to competitors from Poland (2), USA, Sweden, Austria, the Netherlands, Canada, Bulgaria, FRG and USSR.

A role for IUPAC?

The aims of Chemistry Olympiads overlap to some extent those of IUPAC. The International Union of Pure and Applied Physics (IUPAP) already actively supports the Physics Olympiad. So, why is IUPAC not yet involved in the Chemistry Olympiads? I suggest that the IUPAC Committee on Teaching Chemistry (CTC) considers the question and possible IUPAC involvement and support.

Prof. J. Reedijk

For further information on International Chemistry Olympiads and copies of examinations from previous olympiads, write to: Dr P. Petrovic, Central House of Pioneers and Youth, Mierové nam. 1, 81106 Bratislava, Czechoslovakia.

Atmospheric chemistry

Kurt Leichnitz

The Commission on Atmospheric Chemistry (VI.4) has given priority to a project on tropospheric chemistry linked to emissions, workplace atmospheres and indoor air (see *CI* 1985, Vol. 7, No. 4, p. 35 and No. 6, pp. 4–5. In this article, the Chairman of the Commission, Kurt Leichnitz examines the background to this project.

Tropospheric chemistry

The troposphere is that part of the atmosphere which is in closest contact with the Earth's surface. Many natural and synthetic chemicals travel through the troposphere and undergo chemcial transformation in it. Some of the chemicals are removed from the troposphere by rain and deposited on the surface of the Earth — on vegetation and soil, for example. Others move upwards from the troposphere into the overlying stratosphere, where modification of the earth's ozone layer and other effects may occur.

Human and other biological activities, and industrial processes all take place in the troposphere. An agglomeration of industry, population and traffic, in combination with meteorological and topographical conditions, may cause unacceptable levels of air pollution. This means that the situation in the troposphere is of vital importance to the whole atmosphere–water–soil life support system on Earth. Consequently, many fundamental questions have been raised about the basic state and dynamic response patterns of the global tropospheric chemical system. To answer these questions it seems essential that international research programmes are initiated which aim at assessing the processes that influence the chemical composition of the troposphere.

The Global Tropospheric Chemistry Panel in the USA has formulated the long-term goals of such a Global Tropospheric Chemistry Programme as follows:

1. To understand the basic chemical cycles in the troposphere through field investigations, theory aided by numerical modelling, and laboratory studies.
2. To predict tropospheric responses to perturbations, both natural and human-induced, of these cycles.
3. To provide the information required for the maintenance of effective future management of the atmospheric content of the global life support system.

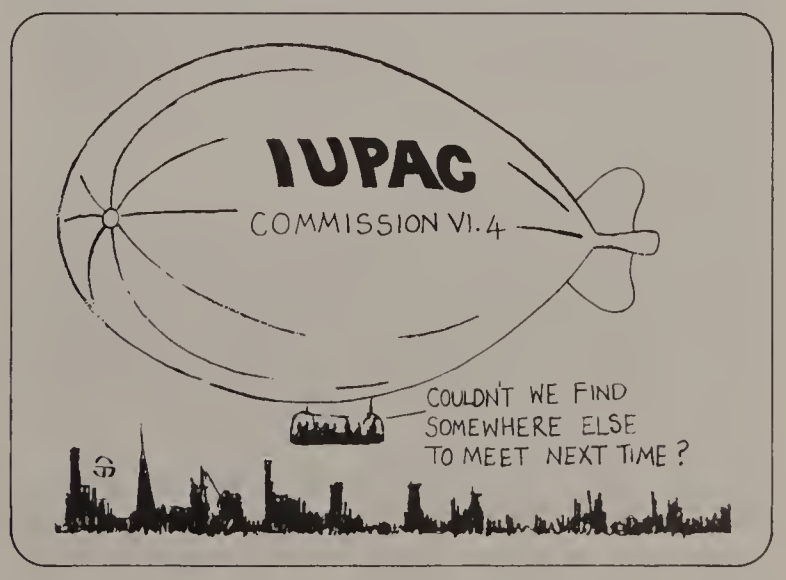
The panel stated that resourses and commitment of the international scientific and political community will be vital to the success of the programme and suggested the inclusion of IUPAC's Commission on Atmospheric Chemistry. The main part of the Commission's programme will be its tropospheric chemistry project. This will be linked to emissions, workplace atmospheres and indoor air.

Kurt Leichnitz, Chairman of the Atmospheric Chemistry Commission.

Sources of tropospheric chemicals

Tropospheric chemicals originate from surface emissions, *in situ* formation from other species present in the troposphere and transport from the stratosphere. Each of these sources contains natural and anthropogenic substances.

According to the Global Tropospheric Chemistry Panel[1] the natural surface sources are affected by a wide range of factors such as season, temperature, nutrient levels and organic content. However, little quantitative information is available on these sources. At present, it is not possible to make accurate global estimates of the natural surface sources of such globally important trace gases as CH_4, N_2O, NH_3, COS, CS_2, H_2S, $(CH_3)_2S$, and CH_3Cl. In industrialized countries such as the USA and countries in Europe there exist



Drilling platform equipped with various high technology systems to prevent contamination of the environment.

relatively reliable inventories of several anthropogenic sources. These include inventories for NO, NO_2, CO and SO_2. For other countries this information is not always available. Information on emissions from low-technology combustion, such as wood fires, is not so well documented even though it seems that biomass burning, particularly in the tropics, may be a significant source of several trace substances in the troposphere.

Aircraft and high stacks produce contaminants above the lower layer of the troposphere and so act as *in situ* sources. Lightning and volcanoes can also introduce gases as impurities — for example, SO_2 and oxides of nitrogen.

The third source for tropospheric substances is the stratosphere. For example, ozone may be transported from there to the troposphere. Ozone is generated by the action of short-wavelength ultraviolet light on oxygen in the stratosphere.

Within the troposphere there exists a very complex system of transportation, distribution and transformation. The lower layer of the troposphere is of particular importance as the natual and anthropogenic surface sources emit directly into this layer. These sources include emissions such as combustion products, chemical emissions from industrial plants, processing of products, motor vehicles and private homes. Industrial emissions, workplace atmospheres and indoor air are all being studied by the Commission on Atmospheric Chemistry.

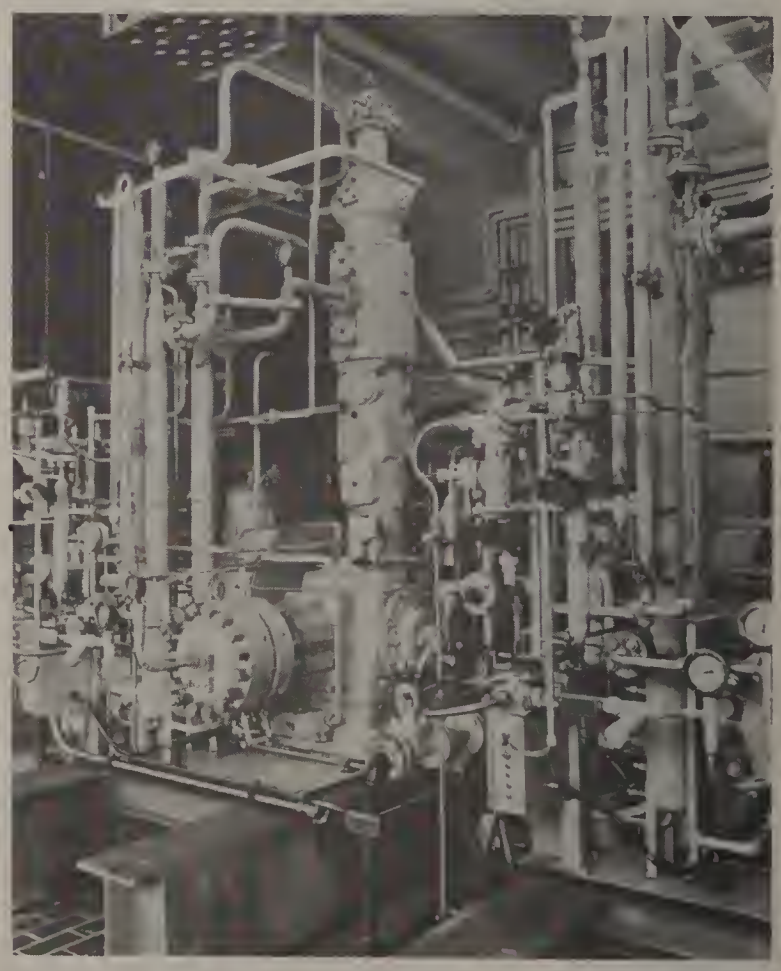
Workplace atmospheres

The workplace is an occupational ecological system and forms a significant part of the total ecological system. In several countries the air in workplaces is regularly analysed and it is thus possible to exercise some control over its quality. Chemistry can thus contribute to the health of the people in the occupational ecological system.

Good quality data on the presence of toxic agents in workplace atmospheres is essential for any monitoring programme. However, there is still a need to harmonize analytical methods and to establish good laboratory practice. The concept of good monitoring practice needs to be established. Such practice should be based on laboratory guidelines which aim to produce high quality analytical and toxicological data.

In recent years many steps have been taken to reduce the exposure of workers to serious workplace hazards such as benzene, vinyl chloride, acrylonitrile and asbestos. But substantial hazards remain. This is partly due to the lack of analytical data. Hazardous situations in workplaces are often not recognized as such. During a seminar in Luxemburg on the role of ambient and biological monitoring it was reported[2] that in 1979 workers in private industry in the USA experienced about 148 900 new cases of occupational illness. This estimate is probably low. One should also note that many people die from latent occupational exposures to substances causing cancer, lung diseases, nerve disorders and other irreversible illnesses.

The ability to establish a sound health and safety programme depends to a large extent on the ability to measure toxic exposure. The analytical techniques for air testing in workplaces are frequently cumbersome or even not well developed. There is also a need to relate the regulatory workplace environmental limit to a precise definition of the quantity to be measured and limited. It is essential to state the period over which the concentration can be averaged. Terms such as "instantaneous" are meaningless since any measurement must provide some form of time-weighted average, even over a very short time. The word "ceiling"



In modern industry processes take place in closed installations.

Protection of workers in hazardous areas. The air required for breathing is delivered from cylinders.

must also be carefully defined to be useful for practical application.

New research, new industries and newly created jobs in growing sectors of the economy produce new hazards. For example, the electronics industry has emerged as an important element in the economic systems of many countries. Technological development of this industry has exceeded development in other industrial sectors. This is due to rapid advances in semiconductor technology resulting in enormous growth of computer systems. The industry deals with materials which were originally thought to be "clean". However, it is now realized that these materials can cause health hazards in workplaces, in electronic component manufacturing and in recycling plants.

There are already several national and international rules, regulations and standards which aim to protect the health of workers. For example, the International Labour Organization (ILO) has issued the following recommendations[3]:

1. The atmosphere of workrooms in which dangerous or noxious substances are manufactured, handled or used should be tested periodically at sufficiently frequent intervals to ensure that toxic or irritating dusts, fumes, gases, fibres, mists or vapours are not present in quantities liable to injure health.
2. The authority concerned with the protection of the health of workers in places of employment should be empowered to specify the circumstances in which it is necessary to test the atmosphere of such workrooms and the manner in which the tests are to be carried out. Such tests should be conducted or supervised by qualified personnel and, where appropriate, by qualified medical personnel who possess experience in occupational health.

Indoor air quality

We all spend much of our time indoors (in houses, automobiles, waiting rooms, stores and restaurants for example). It has been shown that indoor exposure to environmental pollutants can be substantial. Indoor exposure seems to have been largely overlooked in assessing the health effects of environmental pollutants. Indoor pollution in residences, public buildings and offices is created mainly by the occupants' activities. These include the use of appliances, power equipment, smoking, chemicals, clothing, outgassing of building and decorating materials and intrusion of outdoor pollutants. The adoption of energy-saving procedures to reduce ventilation can also increase problems of indoor air quality.

The health aspects of indoor air quality have been reviewed by a working group convened by the World Health Organization (WHO)[4]. Pollutants generated outdoors, such as sulphur dioxide, nitrogen oxides, carbon monoxide, particulates, and photochemical oxidants as well as pollutants from indoor sources were all considered by the working group. The group noted that research on air contaminants had been concerned mainly with outdoor or occupational exposures and expressed its concern about the lack of data on health effects of air quality in the non-occupational indoor environment. The WHO working group recommended that studies on the nature and rates of emission of indoor contaminants be undertaken. It also pointed to the need for effective personal monitors to show total human exposure to air pollutants. In particular, there was a need for devices which can monitor several pollutants and record short-term peaks as well as long-term averages.

In the USA, a Committee on Indoor Pollutants has been appointed at the request of the Environmental Protection Agency (EPA). The Committee prepared a comprehensive report[5] on the quality of the indoor environment. According to this Committee, the present and future quality of the indoor environment are matters of immediate and great concern. Many of the instruments required to characterize long-term and short-term indoor pollutant concentrations do not exist.

References

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2. Berlin, A. *et al.*, *Assessment of Toxic Agents at the Workplace*. (The book is based on material presented at a seminar in Luxemburg, December 1980). Martinus Nighoff Publishers, Boston, The Hague, 1984.
3. Parmeggiani, L., *Current Trends in Occupational Health and Hygiene*. (A paper presented at a seminar in Luxemburg, December 1980.) International Labour Organization.
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Congress of Pesticide Chemistry

Over 1400 scientists from 53 countries attended the IUPAC sponsored 6th International Congress of Pesticide Chemistry in Ottawa, Canada, 10–15 August 1986. Two plenary lectures, 50 symposium lectures and over 100 contributed papers and short communications were presented at the Congress as well as 800 posters.

Scientific programme

There were eight main topics in the Congress, each one consisting of a symposium and several poster/workshop sessions on subtopics. The main topics were

- Synthesis of pesticides and bioregulators
- Chemistry and bioactivity of natural products and prototypes
- Chemical and biological basis of pesticide activity and resistance
- Progress and development in formulation chemistry and technology
- Pesticide residue methodology
- Environmental fates and effects
- Metabolism in plants and animals
- Pesticide toxicology and human health

In addition there were two plenary lectures and two special symposia. One of these, a special symposium on "Importance of collaboratively studied analytical methods" was sponsored by the Association of Official Analytical Chemists (AOAC). The other special symposium on "Biotechnology, pesticides and pest control" was sponsored by Agriculture Canada.

There was continued interest at the Congress in compounds which, when added to a formulation or used in a spray tank, affect the performance of a pesticide. Such compounds include surfactants and safeners. There were also signs at the Congress that technological advances in many areas are outstripping the currently perceived needs for sensitivity and the ability to interpret and use these data. An example is the methodology for determining pesticide residues at very low levels in food and the environment.

Ottawa Congress Centre.

There were many reports on research aimed at elucidating modes of action of pesticides and the mechanisms for their fate in soil and water. There was also much interest in work on the identification and isolation of microoganisms and enzymes which degrade specific pesticides. However, it is still early days in identifying practical uses of this work.

The Association of Official Analytical Chemists (AOAC) table at the Congress. AOAC sponsored a special symposium on "Importance of collahoratively studied analytical methods".

Prof. Roy Greenhalgh, Chairman of the Scientific Programme Committee, was impressed hy the number of contributions from Third World countries.

Award for pesticide research

During the opening ceremony at the Ottawa Congress the Swiss Society of Chemical Industries Award (see *CI*, Vol. 7, No. 5, p. 5, 1985) was presented to Dr Richard A. Dybass for his work on avermectins. Dr. Dybass, who is 42 years old, leads an agricultural research and development team at the Merck Sharp & Dohme Research Laboratories, Three Bridges, USA. The award of a scroll and a cheque for 15 000 Swiss francs was presented by Dr U. Schwieter, Secretary of the Swiss Society.

Avermectins represent a novel class of microbial pesticides which were discovered in the Merck Sharp & Dohme Research Laboratories in the mid-1970s. These natural products were initially discovered as a result of their exceptional activity against worm infections in animals. As a result, one derivative of this avermectin family, namely ivermectin, was developed and is now used worldwide as an antiparasiticide in cattle, horses, swine and sheep. In addition, ivermectin, which is also effective against microfilaria infections, has been found to have potential for use in the control of onchocerciasis or river blindness in Africa and is currently in clinical trials in man with the cooperation and collaboration of the World Health Organization.

However, it was not until the early 1980s that the potential for these natural products and especially one member of that group, avermectin B_1 or abamectin, as an agricultural pesticide was fully recognized in Dybass's laboratories. Since the initial discovery, abamectin, on the basis of its high intrinsic biological activity, spectrum of efficacy, safety and novelty of biochemical action, appears to have the potential to contribute in a significant manner to the control of economically important arthropods on horticultural and agronomic crops worldwide. In addition, because of their novel chemistry and mechanism of action, the avermectins already have had a significant impact on pesticide research worldwide.

The avermectins are characterized by the unique macrocyclic lactone chemistry which has been extensively explored within the agrichemical industry and in academic institutions over recent years. There are today over 100 publications and patents which detail modifications in the avermectin chemical structure and attempts at total synthesis. Within a short period since their discovery, research in Dybass's laboratories has indicated that second generation avermectins — with increased potency and breadth of spectrum — are achievable.

Dr Schwieter (left) presents the award for pesticide research to Dr Dybass.

Dr Dybass who won the award for his work on a novel class of microbial pesticides known as avermectins.

Avermectins possess an unusual mode of action which makes them useful in the control of resistant arthropods. In addition, abamectin has become widely investigated by neurobiologists to further define its true mechanism of action on arthropods. The hope is that these studies will ultimately elucidate specific biochemical targets which can be utilized in the search for new pesticidal compounds.

Furthermore, abamectin represents one of the rare examples of a fermentation product with insecticide application in agriculture. To date the success in the discovery and utilization of microbially derived pesticides has been very limited. As a result, this source for new pesticide products remains largely unexplored. However, at a time when the discovery of new synthetic chemicals of novel mode of action continues to decline — despite increased research efforts — Dybass believes that the development of the avermectins suggests that the search for compounds derived from microorganisms represents a viable approach to finding new toxiphores for application in agriculture. Recent advances in biotechnology and genetic engineering should serve to increase the attractiveness of this area of research by opening the possibilities for improved production costs and broader applications.

Plenary lectures

Two plenary lectures were presented at the Congress: one by Dr Hans Gessbühler, Agricultural Division, CIBA-GEIGY Ltd, Basle, Switzerland and the other

by Dr Ernest G. Jaworski, Biological Sciences Department, Monsanto Chemical Company, St. Louis, USA. The lectures will be published in full in the Congress Proceedings (see below). The following are summaries of the lectures.

Reflections on the future of chemical plant protection research

The environment in which future chemical plant protection research will be conducted is envisaged to be dominated by four major factors:

(a) by rapid further advances in crop and pest biochemistry and molecular biology
(b) by a continuing decrease of the success rate of conventional pesticide research approaches (such as serendipity and random screening)
(c) by the extensive use of electronic information and data processing procedures, not only in research but also in agricultural production (including protection) techniques
(d) by an increasing *economic* and *ecological pressure* on agricultural inputs.

This pressure, in turn, will be reflected in accelerated expansion of modified or new crop production technologies and in further stiffening of regulatory requirements. It will thus impinge indirectly on objectives and strategies to be defined and selected in plant protection research.

The major consequences of this future environment are predicted to be the following:

- *Biotechnology* will be an important component of plant protection strategy and research.
- *(Bio)rational* approaches in the design of new bioactive molecules in terms of their biological performance, toxicological properties and environmental behaviour will become increasingly feasible.
- More sophisticated chemical, biological and safety *testing procedures* will be required to adequately characterize and define the mode of action, practical use and environmental acceptability of new and existing compounds.
- More efficient and safer, i.e. more *target-oriented delivery systems* will be needed, which call for adaptations in formulation and application research and techniques.

Hans Geissbühler

Impacts of biotechnology on agricultural pesticides

The applications of biological organisms, systems and processes to agricultural needs has created a new and exciting wave of biotechnology. These technologies applied to increasing agricultural productivity and to the development of new pest control measures should provide a complementary synergistic addition to the more traditional chemical and genetic approaches currently in use.

Successful transformation of plant cells has been obtained utilizing vectors and DNA delivery methods derived from the plant pathogen, *Agrobacterium tumefaciens*. This soil bacterium is capable of transferring a DNA segment (T-DNA), located between specific nucleotide border sequences, from its large tumor-inducing (Ti) plasmid into the nuclear DNA of infected plant cells.

The exploitation of the *Agrobacterium*/Ti plasmid system for plant cell transformation has been facilitated by:

- The construction of modified *Agrobacterium* strains in which the genes responsible for pathogenicity have been deleted
- the design of intermediate vectors containing selectable drug markers for introducing foreign genes into the Ti plasmid and subsequently into plant cells
- the development of efficient *in vitro* methods for transforming plant cells and tissues with engineered *Agrobacterium* strains.

These modifications have led to the development of simple, efficient and reproducible transformation systems from which morphologically normal transformed plants can be readily regenerated. The foreign genes are stably maintained and expressed in the resulting plants and are inherited by progeny as typical Mendelian traits.

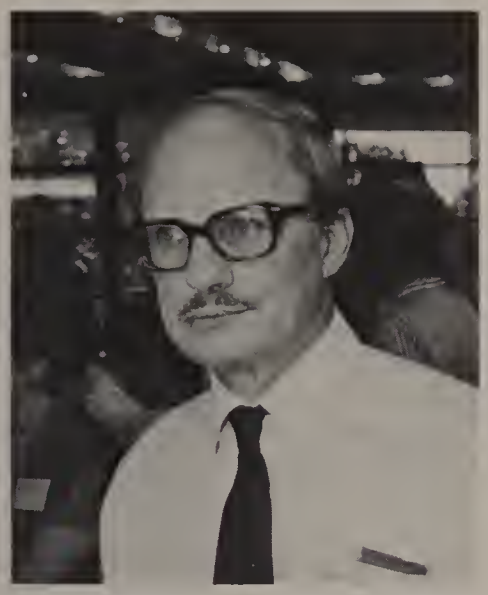
The availability of plant transformation systems has facilitated numerous studies on gene expression and regulation in plants and should eventually allow for the modification of various crop species in an agronomically significant manner. Specific examples of using gene transfer techniques in agricultural applications, including the engineering of herbicide and viral disease resistance, were discussed.

Ernest G. Jaworski

Symposium lectures

Pesticide metabolism studies — a regulatory viewpoint

Pesticide registration is essentially a predictive process, evaluating the potential exposure of humans and other species to a pesticide in relation to its known toxicological properties. A modern pesticide is not expected to persist as an intact molecule and thus a full knowledge of its degradation/metabolism in plants and animals is essential to a complete understanding of the fate of a pesticide. The acceptability of a proposed pesticide use on an edible crop is totally dependent on adequate metabolism studies in crops. Since extrapolation of metabolism data between crops is not always possible the selection of crops for metabolism studies should always include major proposed crop uses. Information on significant degradation products/metabolites should include data on the amounts that occur and analytical methods for their determination. Basic knowledge of the toxicity of metabolites is necessary but if plant and animal metabolites are the same, separate toxicological studies on each metabolite



Pesticide Chemistry Commission Chairman, Ray Bates: "International harmonization of registration requirements and protocols can help eliminate unnecessary national requirements".

are unnecessary.

Although data on the total residues and its components under practical conditions of use form the basis for registration, a legal maximum residue limit can be satisfactorily expressed in terms of a single compound provided that the metabolism studies have established its valid relationship to the concentration of the toxicologically significant residues present.

Metabolism studies on appropriate farm animals are required if a pesticide is applied directly to livestock, animal premises are to be treated or residues occur in crops or crop parts used as feed.

Registration scientists have a responsibility to require only such testing as is necessary for a proper evaluation of potential risks from a pesticide. International harmonization of registration requirements and protocols can help eliminate unnecessary national requirements and the Codex Committee on Pesticide Residues and has made a considerable contribution to such harmonization.

J. A. R. Bates

Ray Bates (Pesticide Registration and Surveillance Department, Ministry of Agriculture, Fisheries and Food, Harpenden, UK) is Chairman of the Commission on Pesticide Chemistry (V1.5). The above is an abstract of the lecture he presented at the symposium on "Metabolism in plants and animals".

Trends in pesticide residue methodology

"Methodology", for the purpose of this contribution, is interpreted as "approach" or "performance", not as "instrumentation".

After 40 years of residue analysis practised around the world, analysts ought now to be able to agree on an answer to the question, "where do we go from here?". In the past, they were mainly involved in disputes over "too high" versus "too low" MRLs ("tolerances") and their analytical implications, e.g. the development of appropriate methods. The new dissonance, which has arisen alongside social evolutions and sociological changes worldwide, centres around sophisticated versus "simple" provisions for the protection of man, animal and environment. It entails legislative measures as well as problems associated with the analytical means available to elucidate residue patterns for a given situation, or to monitor food, feed, and the environment for potential pesticide residues.

What seems essential to some, may be less pertinent to others in this context. The experienced analyst is called upon to serve all of them, however. Seldom did he pay due attention to this challenge in the past, because he felt equally motivated by his ambition for even "better" performance and pressed by the real, or alleged constraint to become "zerobound" in his world of figures. It ought to be possible to achieve greater harmonization of the efforts undertaken by politicians, legislators, and analysts to develop instrumentalities for keeping and measuring residues within generally acceptable bounds, and to agree upon reasonable interpretations of their "significance".

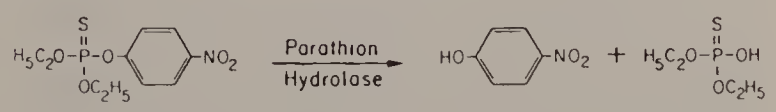
This paper attempts to outline some aspects of the share residue analysts, in conjunction with others, could contribute to the solution of this problem.

H. Frehse

Helmut Frehse (Bayer AG, Monheim, FRG) was President of the Applied Chemistry Division, 1981–85. He is Chairman of the Organizing Committee of the 7th International Congress of Pesticide Chemistry to be held in Hamburg, FRG, in 1990 (see below). The above is an abstract of the lecture he presented at the symposium on "Pesticide residue methodology".

Engineering soil microorganisms for pesticide degradation

Parathion hydrolase (EC 3.1.3] is receiving considerable attention from molecular biologists working with soil microorganisms. The enzyme catalyses the following reaction:



The enzyme exhibits a broad substrate range hydrolyzing a large number of 0,0-diethyl-phosphorothioate insecticides. The enzyme has been isolated and characterized from two bacteria, *Pseudomonas diminuta* and a *Flavobacterium* sp. The two esterases have similar pH and temperature optima and cellular locations, however, differences in relative activities, molecular weights and Kms suggested that they may be different. In *P. diminuta* the *opd* (*o*rgano*p*hosphate *d*egrading) gene responsible for encoding the esterase is located on a 66 kb plasmid termed pCMS1, while in the *Flavobacterium* sp. the *opd* gene is located on a 43 kb plasmic. By use of a DNA probe in Southern hybridization experiments, it was demonstrated that significant homology existed between the two *opd* genes. Similar hybridization did not occur with three other native *Flavobacterium* plasmids (approximately 23, 27, and 51 kb) or with

Applied Chemistry Division President Dr Phil Kearney and Mrs Kearney at the Congress opening ceremony.

genomic DNA from cured strains. Restriction mapping of various recombinant DNA molecules containing subcloned fragments of both *opd* degradative plasmids revealed they are similar, if not identical, for all restriction endonucleases examined.

Research is underway to increase parathion hydrolase production in engineered strains for a number of pesticide disposal projects. Improved enzyme delivery systems for several of clean-up projects are also being investigated. Microbial disposal of the insecticide coumaphos has been successfully demonstrated under both laboratory and field conditions with the *Flavobacterium* sp. The DNA probe may provide a useful tool for a clearer understanding of how pesticide degradative genes arise, move and decline in the soild microbial community. In particular, the probe may provide some insights into the origin and spread of enhanced microbial metabolism in the problem soil phenomenon.

P. C. Kearney, J. S. Karns and W. W. Mulbry

Phil Kearney and co-authors work at the Pesticide Degradation Laboratory, Agricultural Research Service, USDA, Maryland, USA. Dr Kearney is currently President of the Applied Chemistry Division of IUPAC. The above is an abstract of a lecture presented at the special symposium on "Biotechnology, pesticides and pest control".

Poster/workshop sessions

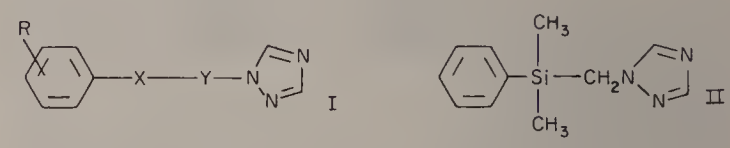
Each session consisted of poster viewing, short oral presentations from invited scientists and discussion. There were approximately 800 contributions in all. Here are the abstracts of just seven.

Silicon-containing triazole fungicides

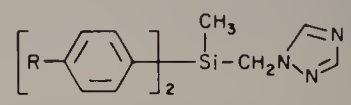
William K. Morberg (Affiliate) *et al.* (USA)

Despite extensive research in organosilicon chemistry going back almost 100 years, commercial use of organosilicon compounds has been limited almost exclusively to polymers. Nevertheless, we decided to investigate incorporation of silicon into agrochemicals, and this poster presents some results in the area of triazole fungicides.

A survey of known triazole fungicides showed that many fit the structural template of Formula *I*: an aromatic ring, usually substituted; a two-atom spacer of carbon atoms or a carbon and an oxygen, invariably substituted; and a triazole. Since silicon–nitrogen bonds tend to hydrolyse easily, we chose to introduce silicon at position X, which led to novel, fungicidally active compounds such as *II*:



Extensive analoging ensued, using readily available silicone polymer intermediates as starting materials. Adding substitutents to the aromatic ring of *II* increased activity, sometimes significantly but the greatest improvement was found when one of the methyl groups of *II* was replaced with a second phenyl ring. From this series, DPX-H6573 was selected for development as a foliar fungicide based on its high potency, curative activity, systemic movement in plants, and broad spectrum of fungi controlled, DPX-H6573 will be marketed worldwide, alone or in combination with other fungicides, for controlling important diseases of cereals, grapes, tree fruits, and other crops.



DPX-H6573

Formulation technique of granules for paddy field application

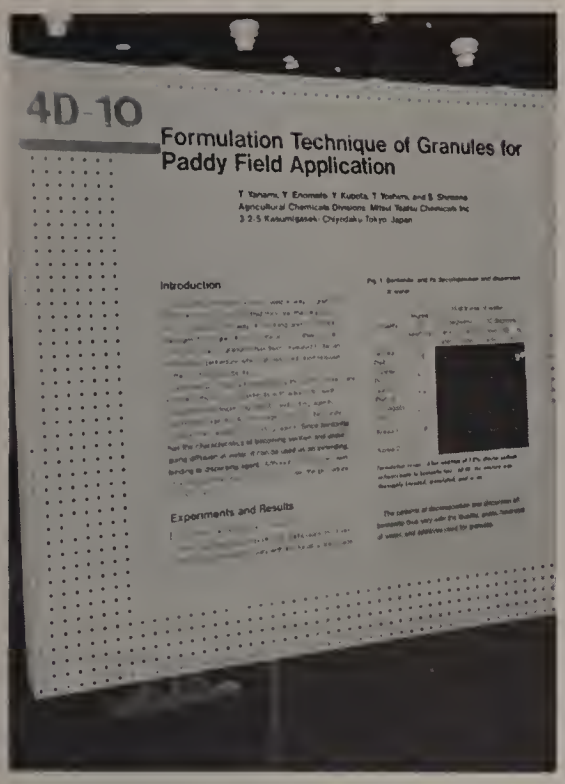
T. Yanami *et al.* (Tokyo, Japan)

In Japan and neighbouring countries, herbicides for application in paddy fields are generally formulated as granules.

Granulated herbicides are able to avoid phytotoxicity, which appears often after application of emulsifiable concentrates and wettable powders of the same active ingredient at the same dosage rate. The application amounts are small, i.e. 3–4 kg of granules per 1000 m^2 are sufficient to clean up weeds in a paddy field.

In order to formulate herbicides granules, powdered *bentonite* with suitable adjuvants is preferable. By varying the granulating process and the composition it is possible to formulate granules of different sizes and diffusion characteristics, thus influencing the release rate of the herbicidal active ingredient into water.

Herbicides which are very slightly soluble in water such as diphenylethers, have to be formulated as small size granules which allow an easy diffusion of the a.i. into water.

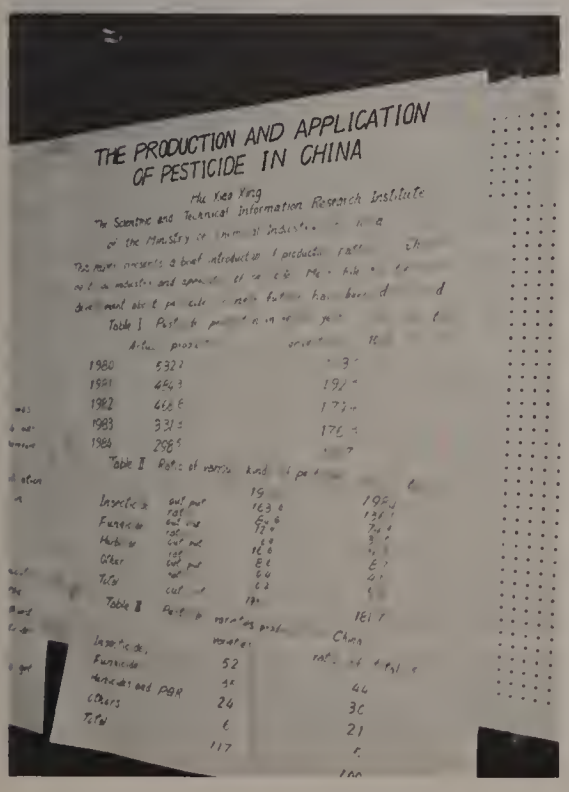


On the other hand, herbicides moderately soluble in water have to be formulated in a rather large size and in such a way that the granules do not disperse nor decompose after application. The use of certain stickers such as CMC allows the control of dissolution rate and thus of the amount of herbicides released in order to avoid phytotoxicity and to prevent as far as possible losses of active ingredients with irrigation water.

The production and application of pesticides in China

Hu Xiao Xing (Beijing, China)

Since the founding of the People's Republic of China, the pesticide industry and plant protection using agrochemicals have developed rapidly in China. At the beginning of New China, the pesticide industry was almost blank, but in 1984, 180 thousand tons (100% active ingredient) of pesticides had been produced and more than 800 thousand tons (formulations) used.



This paper presents a brief introduction pattern of Chinese pesticide industry, including data of productions, varieties and ratio of various kinds of pesticides in recent years. For example, in 1984, there were 117 pesticide varieties produced in China which include 52 insecticides, 35 fungicides and 24 herbicides and plant growth regulators together. In the middle of the 1980s, the ratio of insecticide production was 17% of total pesticide production, the ratio of fungicide production was 17% and the ratio of herbicide production was 5%.

In 1984, the average quantity of pesticides applied per hectare of multiple cropping area was 1335 grams, that of insecticides 975 grams, fungicides 225 grams and herbicides 105 grams. The economic benefit of using agrochemicals was about 1:2.5 in China, i.e. if 1 dollar was spent for pesticides, 2.5 dollars of agricultural benefits could be obtained. Meanwhile, the trends of development about pesticides in the near future were also introduced.

A rapid and efficient method for soil analysis using a capillary column GC/ion trap detector

Kenneth R. Hill (Affiliate) *et al.* (USA)

As part of a project to determine the degradation rates of pesticides in soils which had been previously treated with certain herbicides and fungicides, a capillary column gas chromatograph equipped with an ion trap detector (ITD) was utilized to develop a method for screening large numbers of soil samples for residues employing a new simplified extraction and clean-up procedure.

Soil samples of different pesticide treatment history were fortified in the laboratory with known amounts of the herbicide butylate or the fungicide metalaxyl and incubated at 26 ± 1°C in biometer flasks. Fifteen-gram soil subsamples were withdrawn at selected time intervals over one month, shaken for 30 min with a solution of 75 ml acetone/75 ml water, and allowed to settle. Supernatant aliquots of 50 ml were then extracted sequentially in a separatory funnel with (I) hexane, 50 ml; (II) hexane, 50 ml/acetone, 20 ml; and (III) hexane, 50 ml-acetone, 20 ml and the combined extracts concentrated to 10 ml or less.

Splitless injections of 1–2 µl were made directly into the GC/ITD system fitted with a removable glass liner injection port and a 0.32 mm I.D. × 12 m methyl silicone column. The ITD filaments were turned off during the elution of the solvent peak to avoid an excessive peak signal. Very clean total ion and selective ion chromatograms and mass spectra were obtained with 1 ng or less for butylate and at low nanogram levels for metalxyl with good recoveries and excellent quantitative reproducibility.

Quantitation was by external calibration using peak areas of known amounts of standards. Similar results were achieved with other pesticides. These results were in very good agreement with and confirmed previous analyses on a GC fitted with a packed column and N/P

thermionic detector. The combination of a rapid,. simple, and efficient extraction procedure with determination by large-bore capillary GC/ITD provides an accurate, cost-effective new method for pesticide residues in soils.

Proper choice of determination and clean-up parameters for the most sensitive analysis of multiple pesticide residues

A. Ambrus (Commission VI.5) *et al.* (Hungary)

Dr Arpad Ambrus is a Titular Member of the Pesticide Chemistry Commission. In 1968 he became Head of the Analytical Chemistry Department at the Plant Protection and Agrochemistry Centre in Budapest, Hungary. Since 1984 he has been working in Kabul, Afghanistan on a UNDP project to set up a laboratory to analyse pesticide formulations and pesticide residues in food.

The main advantage of the use of multi-residue procedures is to obtain more information on as many pesticides as possible in different samples within the shortest possible time. Surveying the various multi-residue procedures we can state that the efficiency of the clean-up procedure used in the multi-residue methods is mainly responsible for the detection.

A study was carried out to examine sample loadability of different packed chromatographic columns using thermoionic (TD) flame photometric (FPD) and electron capture (ECD) detectors without clean-up and after column chromatographic clean-up according to the method of Ambrus *et al.* (*J. Assoc. Off. Anal. Chem.*, Vol. 64, p. 733, 1981).

The samples injected originated from root vegetables, from fruits of low chlorophyll content, from crops of high chlorophyll content and firm dry crops of low oil content. A number of pesticides from the highly volatile compounds to non-volatile ones and from the stable compounds to non-stable ones were screened by GC. The compounds included mevinphos, phosphamidon, bromophos, kinalphos, malathion, methylparathion, some organochlorine, triazine and carbamate pesticides.

The authors also point out the importance of knowledge of the loadability of the sample extracts mentioned above by thin layer chromatographic determination using o-tolidine plus KI, p-nitrobenzenediazonium fluoroborate, bioassay with fungispores, enzyme inhibition, $AgNO_3$ plus UV radiation, and p-dimethylaminobenzaldehyde detection.

The results suggested that extracts of matrices may greatly influence the elution pattern and recoveries on various clean-up columns and furthermore the detection limits of GC and TLC determination. The examination proved that GC column conditions and loading tested for stable and non-stable pesticides is a very important factor for the sensitivity and for the sophisticated handling of the multi-residue methods.

Predicting, measuring and minimizing the effects of pecticides on farmland wildlife on intensively managed arable land in Britain

N. W. Sotherton and M. R. W. Rands (Hampshire, UK)

The decline of the grey partridge (*Perdix perdix* L.) in Britain over the past thirty years illustrates how pesticides may have affected some species of farmland wildlife on intensively farmed areas of lowland Britain. Long-term monitoring studies have been used to predict annual rates of chick mortality and explain the observed declines of grey partridges.

Two methods were investigated to minimize the effects of pesticides on farmland wildlife.

1. The screening of compounds to assess the extent of the spectrum of activity against non-pest, non-target insect.
2. The modification of pesticide use on small area of cereal fields for the benefit of farmland wildlife. This involves the exclusion of certain pesticides at certain times of the year on limited areas of cereal fields.

Dr Nick Sotherton answers questions in the workshop on "Methods for predicting and and measuring effects in aquatic and terrestrial ecosystems". Sotherton is responsible for a research programme on the effects of pesticides on farmland wildlife on intensively managed arable land in Britain.

Biotechnology of environmental protection against pesticides

L. A. Golovleva (Commission VI.5, USSR)

Purification of the environment from residues of persistent pesticides is one of the most urgent problems of today. The main trends of ecological biotechnology aimed at the achievement of this goal are the following: screening and molecular breeding of new active strains able to degrade such persistent toxicants as DDT, 2,4,5-T, chlordioxines; plant protection with the help of

Caroline Bolter was one of the many young scientists who attended the congress. She is working on her PhD project at the Agriculture Canada Research Institute in London, Ontario in association with the University of Western Ontario as part of the Research Scientist Training Program. She is investigating the mode of action of fumigant phosphine.

Dr Gyongyi Huber Kovacs is a senior scientist at the Research Institute for Heavy Chemical Industries, Veszprem, Hungary. She is investigating environmental problems and in particular, looking at pesticide degradation in soil, ground water and lake water. Her poster on "Environmental fate of insecticide phosmethylan" was presented in the section "Fate in soil and water".

mycoherbicides and antibiotics breeding of genetically engineered plants with the enhanced ability to degrade residues of pesticides.

Definite success has been achieved in breeding of new strains (*Pseudomonas cepacia* ATCC 1100) and construction of new strains by the conjugative transfer of biodegradative plasmids (*P. aeruginosa* BS816 and BS 827), capable of degrading 2,4,5-T, DDT and kelthan, respectively. Our strains BS816 and BS827, were able to degrade kelthan in laboratory and natural soil ecosystems. Strain BS827 was the most active: kelthan disappeared in 14 days under laboratory conditions and in a month in field experiments in control soil, without the strain less than half of kelthan introduced was degraded. The field investigations revealed a strong influence of a selective factor on the strain stability: the presence of kelthan maintained the population of cells carrying a biodegradative plasmid. The strain-destructor was eliminated rapidly as far as kelthan disappeared from soil. The results obtained give grounds to consider such strains applicable for the local purification of territories contaminated by high concentrations of persistent toxicants.

The next important trend of biotechnology is the replacement of persistent pesticides by biological means for plant protection. For instance, inoculation of seeds and roots by bacteria of genera Bacillus, Pseudomonas, Agrobacterium, etc. prevented some plant diseases. The soil treatment with biomass of some fungi was rather efficient against weeds in rice and soya fields and lemon orchards.

The development of this trend sets biotechnologists great problems, the solution of which depends on joint efforts of microbiologists, ecologists, plant physiologists and molecular biologists.

The breeding of cultivated plants with the enhanced ability to degrade xenobiotics is an extremely complex but intriguing process and already the primary results raise our hopes for success.

Forum

One afternoon of the Congress was devoted to a forum, the purpose of which was to discuss issues which have a major impact on the regulation of pesticides. The issues included the criteria used for decision making, the strengths and weaknesses of regulatory systems and the advantages and disadvantages of international harmonization. The forum consisted of short presentations by invited speakers followed by discussion. The following is an abstract of the presentation by C. F. Wilkinson, (Institute for Comparative and Environmental Toxicology, Cornell University, USA).

Decision making in pesticide use and control

The procedure that is followed in reaching a regulatory decision on whether a given pesticide should be registered and under what conditions it should be used involves a complex series of steps that seeks to weigh the anticipated benefits of the chemical against the potential risks to human health and/or the environment. The final regulatory decision is a value judgment that must be based on an objective scientific evaluation of all available data on the efficacy and potentially adverse effects of the pesticide and must strive to ensure that registration is justified and fully consonant with the overall needs and interests of society.

In the USA, federal efforts to develop a pesticide regulatory policy that on one hand meets the needs of the chemical industry and on the other assures the public that all necessary safeguards are being taken to protect public health and the environment has become an increasingly divisive issue. Encouraged by a sensation-seeking media, the public has become highly concerned over the risks it perceives to be associated with pesticides, suspicious of the motives of chemical industry and mistrustful of federal efforts to act on its behalf. As a result of the pressure of public opinion, the regulatory decision-making process has become a highly charged, emotional issue that is driven more by

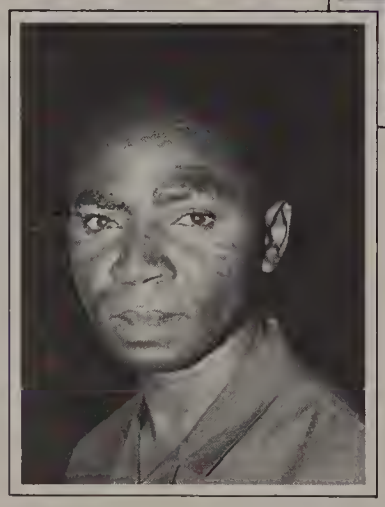
Affiliates at the Pesticide Chemistry Congress

▲ Dr A. I. Okunade became the first Nigerian chemist to register as an Affiliate when he attended the Congress on Pesticide Chemistry in Ottawa. Okunade is a lecturer in chemistry at the University of Ife, Ile-Ife, Nigeria. He displayed a poster on "Natural ant-repellants from some Costa Rican plants".

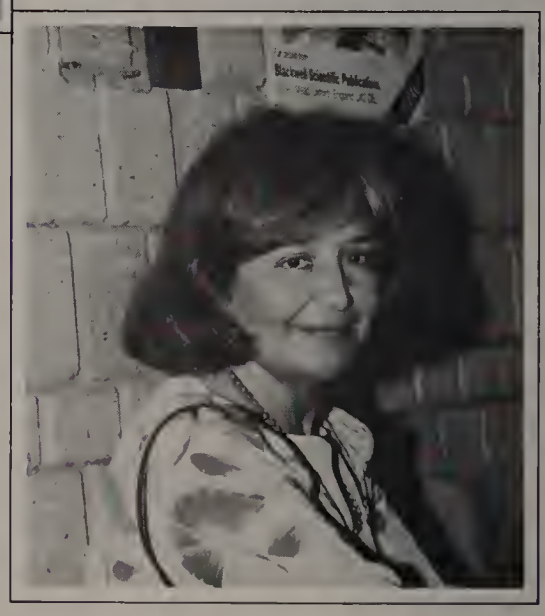
Affiliate Dr Kenneth R. Hill and colleagues from the Agricultural Environmental Quality Institute, Maryland, USA, contributed two posters on developments in instrumentation and techniques: "A rapid and efficient method for soil analysis using a capillary column GC/ion trap detector" (see p. 17) and "An evaluation of large-bore capillary column gas chromatography/ion trap detection for pesticide multiresidue analysis".

▼

◀ Dr William K. Moberg is a research supervisor at the E. I. Du Pont de Nemours & Co Experimental Station in Delaware, USA. He is doing research on the biochemistry of fungi with particular interest in new control strategies. Moberg and three colleagues from Delaware presented a poster at the congress with the title "Silicon-containing triazole fungicides" (see p. 16).



▲ Another first! Dr Asaph Maradufu from the Tropical Pesticides Research Institute, Arusha is the first IUPAC Affiliate in Tanzania. Maradufu is Chief Research Officer at the institute. Research activities include the investigation of naturally occurring pesticides of plant origin.



▲ Dr Lilia Albert registers as an Affiliate at the IUPAC desk at the congress. Dr Albert is interested in pesticides and heavy metal residues. she is Head of the Environmental Pollution Programme at the National Institute for Research on Biotic Resources (INIREB) at Xalapa, Mexico.

But is it legal?

One suggestion strongly voiced at the Congress was that lawyers should replace white mice in toxicology experiments. A number of advantages were proclaimed for such a change. For example, there are more lawyers than white mice and also this development would solve animal rights problems. However, it was thought that the main problem would probably arise from trying to extrapolate the results of these experiments from lawyers to human beings.

perceptions of the potential risks of a pesticide than by considerations of expected benefits.

Despite the continuing efforts of regulatory agencies to seek out and utilize appropriate expert opinion and advice in interpreting the scientific data, the decision-making process often becomes mired down in well-publicized adversarial confrontations between the agency and the industry. Direct public participation in these debates is minimal and usually restricted to consumer advocate or environmental groups whose viewpoints do not always reflect the broad social interest. Such confrontations are not conducive to conducting an objective evaluation of the facts, since they tend to polarize the viewpoints expressed and exacerbate public apprehension, confusion and mistrust.

C. F. Wilkinson

7th International Congress of Pesticide Chemistry

The 7th International Congress of Pesticide Chemistry will be held 5–11 August 1990 in the Congress Centre Hamburg, FRG. The Congress is sponsored by IUPAC. Gesellschaft Deutscher Chemiker will be responsible for the detailed organization of the Congress.

The scientific programme of the Congress will include the following main topics:

- Chemistry and bioactivity of agricultural chemicals
- Biotechnology in agriculture
- Mode of action and resistance
- Formulation chemistry and technology
- Metabolism in plants and animals
- Environmental fate
- Pesticide residues
- Exposure and risk assessment (including monitoring)
- Regulatory principles, setting of tolerances and registration requirements

Congress circulars containing further details will be available from Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, FRG. Telephone: (069) 79 17-366/360; Telex: 4 170 497 gdch d.

"Me big chief Frehse" exclaims former Applied Chemistry Division President. The Indian head-dress was presented to him at the closing ceremony. Dr Helmut Frehse is Chairman of the Organizing Committee of the next International Congress of Pesticide Chemistry.

Congress Proceedings

The *Proceedings of the Sixth International Congress of Pesticide Chemistry* held 10–17 August 1986 in Ottawa, Canada will be published early in 1987 as a single volume hardcover book. The proceedings will contain the two plenary lectures, all the symposia papers and selected presentations from each poster/workshop session.

The proceedings are edited by R. Greenhalgh and will be published by Blackwell Scientific Publications, Oxford, UK. ISBN 0 632 01618 3. Price US-$87.00.

The Congress ends on a high note as the Organizing Committee hold hands and sing the Scottish song "Auld Lang Syne" accompanied by bagpipes.

Commission & Committee News

Major pesticides projects finalized

The Commission on Pesticides met in Barrie, Ontario immediately prior to the 6th International Congress of Pesticide Chemistry in Ottawa and, since many Commission members were involved with the organization, final arrangements for the Congress were discussed. In addition, preliminary ideas for the 7th Congress to be held in Hamburg in 1990 were discussed.

Sine its last meeting, the Commission's report on multi-residue methods for analysis of samples of unknown origin has been published in *PAC*.

The meeting was mainly devoted to completing several major projects. The project on "Recommended approaches to the validation of animal metabolism in relation to man" critically assesses the relevance of mammolian metabolism studies in predicting metabolic fate in humans. This lengthy paper will be published in 1987 and the possibility of issuing it as a monograph is being investigated. The "Potential contamination of ground water by pesticides" was also completed, Hopefully, this report will appear in early 1987. There is broad interest and concern about potential ground water contamination and the IUPAC technical paper should be of considerable value to various national and international organiztions.

The third project almost finalized was "Recommended approaches to evaluation of the environmental behaviour of pesticides". This outlines a stepwise approach to the production of possible environmental behaviour resulting from the use of a pesticide. This project will be finalized by correspondence and published in 1987.

The project on "Optimum use of residues data" also progressed to a final draft stage. This will be finalized subsequently and circulated to Commission members before publication.

Terry Roberts, Secretary of the Pesticide Chemistry Commission.

Only limited time was available to discuss the remaining projects. However, new project proposals were debated and several of these initiated. The topics included impurities in formualtions of pesticides; the use of mass spectrometry in pesticide residue analysis and metabolism studies and thefate of pesticides insurface waters. The latter would serve to complement the ground water project. There was also interest in a short project on analysis for different pesticides containing a common moiety and this will be pursued. A subsequent discussion on membership to identify new members took into account the skills needed for tackling new projects.

Terry Roberts

Harmonization of Collaborative Analytical Studies

A conclusion reached at the 2nd International Symposium on the Harmonization of Collaborative Analytical Studies (Washington DC, USA, 25–27 October 1984) was to continue efforts toward harmonization. For this purpose, a workshop has been organized with the objective of harmonizing protocols.

The workshop will be held in Geneva, Switzerland, 4–5 May 1987. A substantial discussion document embracing the recommendations concluded in Washington is in the course of preparation and will be distributed to all organizations participating in the workshop. The workshop will discuss the issues raised in this document and will attempt to reach final agreement on these. A further aim is to prepare an IUPAC Manual based on these decisions.

A discussion paper for "Harmonization of Protocols for the Design, Conduct and Interpretation of Collaborative Studies" is being prepared by Dr Bill Horwitz (USA) on behalf of the IUPAC Working Party on the Harmonization of Collaborative Analytical Studies. The contents and recommendations of the draft paper were discussed when the Working Party met at Bristol, UK in July this year. The discussion paper will contain 11 chapters and 3 appendices:

1. Introduction
2. Nomenclature

Dr J. Parkany (left), Dr W. Horwitz (centre) and Dr G. Svehla harmonize for the photographer during their working party meeting in Bristol.

3. Performance requirements of a method of analysis
4. The fundamental basis of collaborative studies
5. Design considerations
6. The size of the collaborative study
7. Systematic error control
8. Outliers
9. Expression of results
10. Acceptability criteria
11. References

Appendix I Definitions involved in interlaboratory studies

Appendix II Rules for rounding and retention of significant values

Appendix III Recommendations 1–11

Oils, fats and derivatives

The Commission on Oils, Fats and Derivatives (VI:3) dates back to 1930 when it was founded in Paris. Apart from the World War II years, it has worked continuously on problems connected with oils and fats ever since.

The main task has been to propose, elaborate and test methods for characterization of oils, fats and derivatives through international cooperation. This work has resulted in Standard Methods for the physical and chemical characterization of fats and oils and products derived therefrom. These methods were published as the 6th edition of *Standard Methods for the Analysis of Oils, Fats and Derivatives* in 1979. The 7th edition will appear soon.

The Standard Methods have gained wide acceptance by international organizations such as Codex Alimentarius Commission of FAO/WHO and Committee TC 34/11 of the International Standardization Organization (ISO) as well as by research and control laboratories throughout the world.

Currently, about 100 scientists in various Working Groups are actively engaged in new Commission projects. In addition, preliminary studies are being carried out on new subjects with a view to preparing improved methods of characterizing materials.

Östen Levin

High temperature and solid state chemistry

When Commission II.3 met in Moscow, USSR, 11–12 June 1986 it recommended a delay in implementation of the proposed renumbering of the groups of the Periodic Table 1–18. Members of the Commission have the opinion that inadequate response was obtained outside the inorganic chemical community before the proposed change was pushed through the processes. They believe that implementation of this proposed change should be delayed for at least four years during which time attitudes among ceramists, metallurgists, materials scientists, and physicists, as well as chemists, should be explicitly sought. The Commission urged IUPAC to consult with the International Union of Pure and Applied Physics (IUPAP), The International Union of Cystallography (IUCr) and other unions before any change is made.

At Moscow, the Commission noted another publication — an article in Dutch on the oxygen gauge project — received reports on the next two international conferences on high temperature and energy-related materials, approved plans for 12 projects and received reports from the completed task forces:

High temperature mass spectrometric ionization cross-sections. The purpose of this project is to prepare a critical assessment of electron impact ionization cross-sections for atoms and molecules of importance for high temperature studies; to compare these with theoretically calculated values; and to prepare a critical assessment of values for dissociation energies of selected diatomic molecules of particular importance in high temperature chemistry.

Recommended procedures for microanalysis of glasses. This project aims to define future activities of a possible task force with the same title. Initially the study group will investigate the possibilities of mounting a collaborative experimental project that would use the electron microprobe analysis technique for the surface analysis of glasses. The long range goal is to recommend standard procedures for glass analysis. An international group of 15 scientists from ten countries has been established. Specimens of glass sample G-1 have been submitted to the participants with the request to make quantitative analysis by means of the electron microprobe.

Commission II.3 meeting in Moscow. "Implementation of the proposed renumbering of the Groups of the Periodic Table" should be delayed.

Carbide–graphite secondary temperature standards. The aim of this activity is to recommend as secondary temperature standards several metal carbide–graphite systems whose eutectic or transition temperatures will be established by collaborative measurements in several laboratories. The principal problem associated with this project is the extreme difficulty of the preparation of the samples.

The bibliography on the high temperature chemistry and physics of materials. This project publishes a quarterly citation to current literature in the high temperature field. This bibliography is a self-supporting one and is distributed on a subscription basis.

Reassessment of high temperature bibliography. This committee reassesses the content, mode of preparation and method of publication of the High Temperature Bibliography published by Commission II.3. This bibliography has been a very successful activity of the Commission for some 20 years. It enjoys a good circulation and is essentially a self-financing operation.

Nomenclature of non-stoichiometric compounds. This project entails the preparation of an entirely new, extensive text on the nomenclature of solids. This text is to replace Chapter 9 of the Red Book. This work is carried out in conjunction with Commission II.2.

Nomenclature of graphite-intercalation compounds. The purpose of this project is to provide a consistent and internationally accepted terminology and nomenclature for graphite-intercalation compounds.

Phase transition terminology. This project aims to collect and define a comprehensive set of terms used to describe phase transitions. The initial study will concentrate on transitions in or linked to the solid state. The definitions will be communicated widely prior to publication to ensure suitability.

Terminology and characterization of carbon. This project has two parts. The purpose of the part on "Terminology" is to prepare and publish definitions for about 90 terms that have been used to describe the many types of carbon and graphite. Publication will occur in several parts, phases, or stages. The part on "Characterization" aims to recommend testing methods for the characterization of all carbon and graphite materials using the most advanced techniques.

Thermodynamic and transport properties of alkali metals. This project has published a critical compilation of the structural, thermodynamic and transport properties of alkali metals, entitled *Handbook of Thermodynamic and Transport Properties of Alkali Metals* edited by Ohse (see *CI*, Vol. 8, No. 4, pp. 22–23, 1986). Translation into Russian is beng considered.

Inconsistencies and inadequacies in the high temperature thermochemical data of the elements. The aim of this project is to examine the high temperature thermochemical data of the elements to discover where a serious inconsistency or inadequacy may exist. A possible follow-on experimental project could be mounted to remove the shortcomings.

Melting points of refractory oxides. This project had two objectives. (1) To publish recommended melting points, with uncertainties, for those oxides for whch literature values are seemingly sufficiently concordant (oxides of Groups II, III, IV, and rare earths), and (2) to sponsor a collaborative experimental investigation in several laboratories to establish melting point values for other well-characterized oxides, especially CaO, Gd_2O_3, and HfO_2.

Reference electrodes for high temperature solid state EMF studies. This project publishes mutually consistent standard values of oxygen potentials for a few high temperature reference electrodes which can be recommended for high-quality work in solid state electrochemistry. Recommendations on the higher oxygen pairs in the form of equations for $\Delta G = f(T)$, for Cu_2O, Wustite (Fe-saturated), and NiO, shortly to appear as a *Geological Survey Bulletin*, will be consistent with CODATA Key Values, will probably be the basis for assessments on Fe and Ni compounds by the CODATA Chemical Thermodynamic Tables Task Group and will probably be regarded as fixed for the assessment of values for lower potential oxide buffers.

Zirconia-based electrolytes for high temperature solid state oxygen gauges. The purpose of this project was to evaluate commercially available zirconia-based electrolyte tubes for oxygen gauges. Measurements in ten laboratories were made on zirconia tubes obtained from five manufacturers. A brief description has appeared in *CI*, Vol. 6, No. 4, p. 12, 1984.

Paul W. Gilles

"Mutual Teaching" seminar planned

An informal meeting of the Macromolecular Division Committee was held on 27 June 1986 in the famous Blois castle, France, following the 5th IUPAC International Symposium on Ring-Opening Polymerization.

One of the important subjects of the meeting was the future plans of IUPAC sponsored symposia in the field of macromolecular science. There are two categories of symposia, multi-topic (bigger) and single-topic (smaller) ones. A previous agreement among Division members concerning the frequency of multi-topic symposia which usually cover most fields of macromolecular science, was confirmed. These will now be organized every other year.

In 1987, a multi-topic symposium, MACRO '87, is to be organized in Merseburg, DDR. Further multi-topic symposia will then be held in even years to avoid clashing with IUPAC Congresses which are held in odd numbered years. It is now planned to hold MACRO '88 in Kyoto, Japan, and MACRO '90 in Montreal, Canada. IUPAC sponsorship has been approved or provisionally approved for seven single-topic symposia in macromolecular science in 1987.

Concerning the geographical distribution of IUPAC-sponsored symposia, it is noteworthy that the Macromolecular Division has provisionally approved granting IUPAC sponsorship to the International Symposium on Molecular Design of Functional Polymers in Seoul, Korea in 1989 and that on Characterization and Analysis of Polymers in Australia in 1991.

Recent activities of Commissions IV.1 and IV.2 were reported. Under Programme B, three new working parties are in preparation in Commission IV.2. These are on "Interaction of man made macromolecules with living systems"; "Polymeric liquid crystalline systems" and "Computer modelling of free-radical Polymerization".

In relation to the interdivisional activities of the Commission on Biotechnology, the division has decided to join to these activities. This is because polymers play an important role in this area especially in separation techniques and in the fixation of bioactive materials. The division has also responded positively to the proposal for an interdisciplinary working party on "Thin film on solid".

At the Blois meeting, a new plan for scientific seminars was discussed. The purpose of these are to "know each other" and "teach each other". A half-day seminar for Division members is planned to take place between business sessions of the Division during the Boston General Assembly. The Division members are professional experts in research on macromolecular science. It was therefore thought useful to organize such a seminar where three or four Division members deliver presentations on a voluntary basis.

Takeo Saegusa

Clinical chemistry

At its meeting in Milan, Italy, 23–24 May 1986, the Executive Committee of the Clinical Chemistry Division reviewed in detail the work of the Division's Commissions. The Commissions on Quantities and Units, Teaching and Toxicology had all made good progress in several areas. It was greatly regretted that the Bureau and the Council of IUPAC had resolved to terminate the Commission on Teaching at the Boston General Assembly, 1987. The work of the Commission on Automation and Clinical Chemistry Techniques was being directed towards new activities, and it was encouraging that several long-standing projects were in the course of being completed.

Dr W. N. Aldridge, Secretary General of the International Union of Toxicology (IUTOX) participated in the discussion of the programme of the Commission on Toxicology, and lines of future collaboration between IUTOX and the commission were drawn. It was also noted that IUTOX might usefully collaborate with other IUPAC bodies, for example with the reconstituted Commission on Biotechnology and the Commission on Pesticide Chemistry of Applied Chemistry Division. Areas of common interest between the Commission on Toxicology and International Federation of Clinical Chemistry (IFCC) and the World Health Organization (WHO) were also considered.

In the discussion of future meetings, it was agreed that plans for the Division's participation in the 34th General Assembly, Boston, were well advanced. The possibility of mounting a post assembly symposium in Farmington would be explored by Porf. Sunderman. It was noted with satisfaction that clinical chemists will make a substantial contribution to the programme of the 31st IUPAC Congress, Sofia, 1987, but doubts were expressed about the scientific value of congresses which sought to cover the whole field of chemistry. Concerning CHEMRAWN, the Executive Committee endorsed the views of Division Committee members in criticizing the relatively narrow scope of the scientific programme of the CHEMRAWN meeting held in Heidelberg, September, 1986.

J. Järvisalo

Provisional Recommendations

IUPAC seeks your comments

In this section we publish synopses of IUPAC's latest provisional recommendations on nomenclature and symbols. All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports.

System for symbolization of reaction mechanisms

The system is designed to provide simple descriptions of reaction mechanisms suitable for use in oral and written communication. The need arises because the system originally devised by Ingold is becoming increasingly overburdened with non-systematic modifications.

The new system describes a mechanism in terms of bond making (symbolized A for "attachment") and breaking (D, "detachment"), with subscripts and other symbols to indicate the pattern of electron movement. For example A_ND_N describes a single concerted process involving nucleophilic bond making and nucleofugic bond breaking (such as the S_N2 Ingold mechanism), and A_N+D_N represents a two-step process (such as S_N1). There is provision for describing homolytic and cyclic mechanisms, for diffusional control, and for electron transfer. Separate provision is made for symbolizing extra-mechanistic information, including the class of transformation, the nature of the substrate, and the occurrence of catalysis, using easily pronounced terms. Thus the symbol Em-AL-B describes an elimination from an alkyl substrate under general base catalysis.

Detailed linear representation of reaction mechanisms

These rules describe a system for the representation of models of reaction mechanisms in a linear form, using standard computer characters. A model of the reaction mechanism is described in a sufficiently detailed manner that most of the important features can be represented, and the notation can be related to the conventional diagrammatic representation of reaction mechanisms. The detail given is, however, such that it is not intended that the representation should be used in speech. The model is described primarily in terms of bond making and bond breaking steps, but the representation allows the encoding of much other information. It allows the representation of single reaction steps or reaction sequences, and should specify exactly how the reagents are converted into the products. It is primarily designed for thermal organic reactions, but is not in principle limited to that field.

Comments on both reports should be sent by 31 August 1987 to the Secretary of the Commission on Physical Organic Chemistry: Dr R. A. Y. Jones, School of Chemical Sciences, University of East Anglia, University Plain, Norwich NR4 7TJ, UK.

Publications

Mathematics and Computational Concepts in Chemistry

This book contains the invited and special lectures presented at the International Symposium on the Applications of Mathematical Concepts to Chemistry held in Dubrovnik, Yugoslavia, 2–5 September 1985. The symposium was sponsored by IUPAC in conjunction with the Union of Chemical Societies of Yugoslavia, the Croatian Chemical Society and the Department of Physical Chemistry of the Rugjer Boskovic Institute of Zagreb.

The symposium brought together mathematical chemists, computer chemists, theoretical chemists, mathematically and theoretically minded experimental chemists, mathematical physicists and mathematicians, for discussions about the status of mathematical chemistry, its perspectives and its influence on various aspects of chemistry.

The last day of the symposium was dedicated to the memory of the late Prof. Andrej Ažman who in

Addresses of National/Regional Centres

If you would like to comment on provisional recommendations please write to your nearest national/regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of national/regional centres is shown below.

Argentina

Dr J. M. Barnett, Asociación Química Argentina, Sánchez de Bustamente 1749, Buenos Aires, Argentina.

Asia (Australia, Bangladesh, Hong Kong, Indonesia, Iraq, Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Thailand)

Prof Huang Hsing Hua, Chemistry Department, National University of Singapore, Kent Ridge, Singapore 0511.

Bulgaria

Prof. O. Peshev, Bulgarian Academy for Sciences, Centre for Chemistry, Academician G. Bonchev Street, Building 11, 1040 Sofia, Bulgaria.

Canada

Prof. J. ApSimon, Department of Chemistry, Carleton University, Ottawa, Ontario K1S 5B6, Canada.

China

Prof Cui Meng-Yuan, Chinese Chemical Society, POB 2709, Beijing, China.
Prof F. C. Chen, Department of Chemistry, National Taiwan University, POB 30–373, Taipei 107, Taiwan.

Czechoslovakia

Dr Karel Bláha, Czechoslovak Chemical Society, Hradcanské nám. 12, 118 29 Prague 1, Czechoslovakia.

France

Prof Y. Jeannin, Comité National de la Chimie, 28 rue Saint-Dominique, F–75007 Paris, France.

FRG, Austria and Switzerland

Prof H. Grünewald, c/o Verlag Chemie GmbH, Postfach 1260/1280, Pappelallee 3, D–6940 Weinheim, Federal Republic of Germany.

Hungary

Prof E. Pungor, Altalános és Analitikai Kémiai Tanszék, Budapesti Müszaki Egyetem, Gellért tér 4, H-1521 Budapest XI, Hungary.

India

Mr A. K. Bose, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi–110002, India.

Italy

Prof F. Rallo, c/o Società Chimica Italiana, 48 Via le Liegi, 1–00198 Roma, Italy.

Japan

Dr H. Hamada, Executive Director, Chemical Society of Japan, 1–5 Kanda Surugadai, Chiyoda-ku, Tokyo, 101 Japan.

Netherlands

Ir E. J. de Ryck van der Gracht, Koninklijke Nederlandse Chemische Vereniging, Postbus 90613, 2509 LP Den Haag, Netherlands.

Scandinavia

Dr K. Samuelsson, Tjänstedata, S–105 32, Stockholm, Sweden.

South Africa

Dr J. R. Bull, Organic Chemistry Division, National Chemical Research Laboratory, POB 395, Pretoria 0001, Republic of South Africa.

UK

Dr A. McNaught, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.

USA

Dr Marianne Brogan, Journals Department, American Chemical Society, 2540 Olentangy River Road, POB 3330, Columbus, Ohio 43210, USA.

USSR

Prof G. B. Bokij, Commission on Nomenclature, National Committee of Soviet Chemists, Academy of Sciences of USSR, Kosygin Street 4, SU–117977 Moscow V–334, USSR.

If you are not within the jurisdiction of any of these centres, please write to: Dr K. L. Loening, Chemical Abstracts Service, POB 3012, Columbus, Ohio 43210, USA.

his time was the leading chemical theoretician in Yugoslavia and inspiring supporter of mathematical chemistry. During the symposium preliminary steps were made to establish an International Society of Mathematical Chemistry.

This volume stands at the interface between mathematics and chemistry. Chapter 1 is devoted to the Introductory Remarks by Nobel Laureate Prof. V. Prelog who celebrated his 80th birthday in 1986. Prelog is one of the great organic chemists this century. His early work concentrated on the structure elucidation of alkaloids from *Cinchona, Strychnos* and other source. His later work on the metabolic products of microorganisms was influenced by the newer physical methods for determining the constitution and configuration of natural products. The work led him, together with R. S. Cahn and Sir Christopher Ingold to develop the now universally adopted *R,S* system for the specification of the sense of chirality at tetrahedral centres. In 1975 Prelog shared the Nobel Prize for Chemistry with Sir John Cornforth.

From 1951 to 1955 Prelog served as a Member of IUPAC's Commission on Nomenclature of Organic Chemistry under the chairmanship of the legendary Prof. P. E. Verkade (see *CI*, Vol. 8, No. 4, p. 27, 1986).

Prelog's introductory remarks

About 200 years ago Immanuel Kant wrote in his "Kleinere Schriften zur Naturphilosophie": "Ich behaupte, dass in jeder besonderen Naturlehre nur so viel Wissenschaft angetroffen werden könne, als darin Mathematik anzutreffen ist". He wrote then: "Solange also noch für die chemischen Wirkungen der Materien aufeinander kein Begriff aufgefunden wird, der sich konstruieren lässt . . . eine Forderung, die schwerlich jemals erfüllt werden wird — so kann Chemie nichts mehr als Kunst oder Experimentallehre, niemals aber eigentliche Wissenschaft werden". Just about the same time Lavoisier was introducing mathematics into chemistry through his use of the balance. The law of definite proportions became the basis of stoichiometry and every chemist–artist had to learn some arithmetic.

Vladimir Prelog, Nobel laureate in Chemistry 1975 (*Photo courtesy Nobelstiftelsen, Sweden*).

The next great step in development of chemistry was the structural theory, but the pioneers in this field, Butlerov, Couper and Kekulé did not realize that the structural formulae are actually mathematical objects, graphs. It was the mathematician Arthur Cayley who first became aware of that and he developed the theory of tree-graphs by trying to calculate the number of possible constitutional isomers of paraffin hydrocarbons C_nH_{2n+2}. Later, Georg Polya, in an encounter with problems of isomerism discovered his famous theorem which became one of the fundaments of combinatorics. These mathematical achievements, however, had very little impact on the daily praxis of chemists, because their everyday problems were usually so simple that they could mostly be solved by trial and error.

Soon after the structural theory had been developed Jacobus Hendricus van't Hoff and Achilles Le Bel founded organic stereochemistry and Alfred Werner the stereochemistry of inorganic complexes. Symmetry, disymmetry and asymmetry became recognized as important features of molecules, and although group theory was clearly the branch of mathematics most appropriate for treating problems in this area very few chemists made use of it.

The gate of entrance for more sophisticated mathematics into chemistry was and still is physical chemistry. Step by step methods of mathematical physics penetrated into chemistry: first calculus, to deal with problems of chemical thermodynamics and kinetics, then linear algebra and group theory, as additional tools of quantum chemistry and molecular spectroscopy.

The more recent general impact of computers on chemistry and on chemists cannot be overestimated. Without computers theoretical chemistry, structural analysis by diffraction methods, molecular mechanics, etc. could not have developed far, and the collection, retrieval and classification of the terrifying multiplicity of chemical data would be almost impossible. The design of syntheses and analyses of reaction pathways are other promising applications.

Last but not least topological aspects of chemical concepts such as e.g. aromaticity, should be mentioned. Thus the progress of chemistry depends more than ever on applications of mathematics.

The important aims of such conferences as this one are to bring together scientists who use the many different branches of mathematics in chemistry and to bridge existing gaps between them, to learn about the new work of pioneers and about the progress in established fields. The titles in the programme indicate that almost all mentioned

topics will be covered.

In summary one can say that chemistry today includes quite enough mathematics to be considered a respectable science from the Kantian point of view, but let us also not forget what Lord Kelvin said about physics: "It is as dangerous to let mathematics take charge of physics as to let an army run a government".

Mathematical and Computational Concepts in Chemistry *is edited by N. Trinajstic and published by Ellis Horwood Ltd, Chichester, UK (1986). 364 pp. ISBN 0 85312 934 7. Price £49.50.*

Macromolecules

Most of the lectures presented by invited speakers at the 30th IUPAC International Symposium on Marcromolecules, held in The Hague, Netherlands, 18–23 August 1985 have been published as Vol. 1 of *Makromol. Chem., Macromol. Symp.* (1986)

Although pure and applied macromolecular science is still greatly expanding and showing interesting aspects from various points of view, it was decided that the symposium in The Hague would focus on a limited number of topics only, originally distributed over five microsymposia. The subjects of these microsymposia and their subdivisions were selected for the actuality of and recent progress in these areas, as well as for their importance in the pure and in the applied field of macromolecular science. The following titles for the microsymposia were selected:

1. Water-soluble polymers (including biopolymers, synthetic polymers and polyelectrolytes);
2. Reactive polymers (including polymeric reagents, polymeric catalysts, polymeric sorbents and chelates as well as radiation curing);
3. Polymers (at) interfaces (including interactions at interfaces, microdomains and biomedical aspects);
4. (Engineering) Materials (including composites and blends, strong fibres as well as elastomers); and
5. (Di)electric properties (including conducting and photoconducting polymers, electrets and piezo-electrets.

A sixth microsymposium on theoretical aspects was added afterwards, but with short communications and posters only.

For each of the other microsymposia, two or three main lectures were invited. This volume contains the text of eight out of the eleven main lectures presented at the symposium.

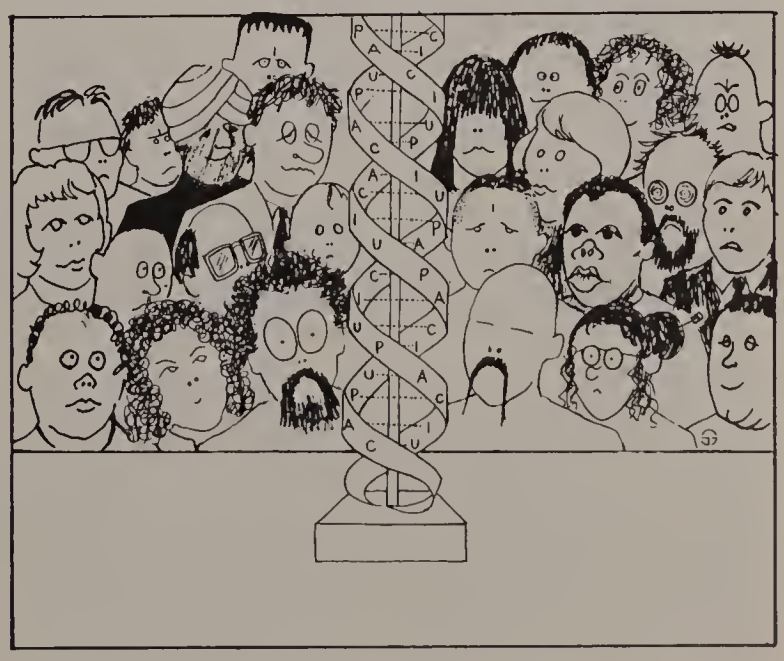
Four plenary lectures, with subjects falling outside the topics of the microsymposia, were also presented at the meeting in The Hague. The text of all these four lectures appear in the beginning of this volume. They include the opening plenary lecture presented by Prof. Paul J. Flory. At that time, nobody could foresee that this would be one of the last lectures to be delivered before an international audience by this outstanding macromolecular scientist. Shortly after returning home from the symposium, Prof. Flory, sadly enough, passed away.

Paul Flory (1910–85). An "outstanding macromolecular scientist" who was awarded the Nobel Prize for Chemistry in 1974.

Natural Products Chemistry 1984

The scientific programme of the 14th IUPAC symposium of this series developed the traditional scope of the chemistry of natural products and expanded into new biochemical areas, exploring structurally and functionally more the more complicated biomolecules.

This book contains 52 invited lectures, grouped into five main sections. The first part contains papers dealing with isolation, structure elucidation and transformation of different classes of natural products. The papers in Part B cover topics including total synthesis, new synthetic methods and synthesis of nucleic acid fragments. Next is a group of papers (Part C) which emphasize new applications of spectral methods and organic crystal chemistry. Part D covers several aspects of the field



of bioorganic chemistry such as enzyme and coenzyme chemistry, mode of action of biologically active compounds, and bio-synthesis of proteins and alkaloids. Finally, Part E — Biopolymers — deals with the chemistry, structure and dynamics of nucleic acids, specific interaction of nucleic acids with proteins, modified nucleotides in nucleic acids, conformation and function of proteins. In addition some papers are devoted to recent achievements and prospects of application of DNA recombinant technology in plant science and agriculture with emphasis on nitrogen fixation.

The book reflects the growing keen interest of the majority of chemists in this field throughout the world. It contains much of interest to scientists working in the field of chemistry of natural products, biochemistry, bio-organic chemistry, pharmacology, agriculture, and enzymology.

This book is edited by R. I. Zalewski and J. J. Skolik and published by Elsevier, Amsterdam, Netherlands (1985). xviii + 686 pp. ISBN 0 444 42457 1. Price: US-$142.50/Dfl 385.00.

Clinical chemistry recommendations

Two papers in the International Federation of Clinical Chemistry (IFCC) series of recommendations on measurements of catalytic concentrations of enzyme have recently been published:

Part 2. IFCC Method for Aspartate Aminotransferase (*L*-Aspartate: 2-Oxoglutarate Aminotransferase, EC 2.6.1.1), *J. Clin. Chem. Clin. Biochem.*, Vol. 24, No. 7, pp. 497–510, 1986.

Part 3. IFCC Method for Alanine Aminotransferase (*L*-Alanine: 2-Oxoglutarate Aminotransferase, EC 2.6.1.2), *J. Clin. Chem. Clin. Biochem.*, Vol. 24, No. 7, pp. 481–495, 1986.

FAO Documentation — Current Bibliography

FAO Documentation — Current Bibliography is a bi-monthly list of selected documents and publications produced by or on behalf of the Food and Agriculture Organization of the United Nations. Each issue consists of two parts: the first, the bibliography proper, is arranged by accession number order and gives full bibliographic details including subject index terms for each item; the second part consists of subject, geographic and author indexes.

A complete set of all documents listed is available in microfiche on a subscription basis, at an annual cost of US-$2000. Special terms are available for institutions in developing countries. *For full details of this service please write to the Chief Librarian, David Lubin Memorial Library, FAO, Via Delle Terme di Caracalla, 00100 Rome, Italy.*

Ionizing Radiation: Sources and Biological Effects

This extensive report — with the above title — covers biological and physical effects of atomic radiation. It provides an authoritative and detailed view of the scientific information available in this field. There are chapters on: Exposures resulting from nuclear explosions; Exposures resulting from nuclear power production; and Genetic effects of radiations. The book is the report on the findings of the United Nations Scientific Committee on the Effects of Atomic Radiation to the General Assembly of the United Nations.

United Nations Sales Number E.82.IX.8. Price US-$63.00 or Sw.Fr. 115.–. Also available at the same price in French and Spanish.

Enzyme Nomenclature

A document entitled "Enzyme Nomenclature. Recommendations 1984: Supplement 1: Corrections and Additions" has appeared in *Eur. J. Biochem.*, Vol. 157, pp. 1–26, 1986. The document contains 107 entries for new enzymes which have come to light since the finalization of the 1984 edition at the end of November 1983 (see *CI*, Vol. 8, No. 6, p. 5, 1985).

Environmental behaviour of chemicals

SCOPE Report 25: Appraisal of Tests to Predict the Environmental Behaviour of Chemicals* appraises tests to predict the environmental behaviour of chemicals, giving expert evaluation of testing protocol. Methods and evaluations include descriptions of important transfer and transformation processes in air, soil and water. The qualification of key processes and reactions is described and appraised for accuracy, precision and utility and the limitations of specific laboratory and field techniques are discussed. Promising new methods are presented with recommendations for further research.

The book contains an up-to-date literature survey, making it a valuable reference source for soil scientists, atmospheric scientists, biologists, ecotoxicologists and government departments concerned with environmental testing.

The report is edited by Patrick Sheehan, Friedhelm Korte, Werner Klein and Philippe Bourdeau and published by John Wiley & Sons, 1985. xv + 380 pp. ISBN 0 471 90545 3. Price £42.50.

*SCOPE is the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions (ICSU).

Radiation: Doses, Effects, Risks

"Radiation . . . does kill. At low levels it can cause cancers and induce genetic defects that can affect children, grandchildren and later descendents, etc." These words are taken from a booklet entitled *Radiation: Doses, Effects, Risks*. The booklet summarizes what solid information exists and provides a full background to the present and future debates on the question of radiation. The contents include: Radiation and Life; Natural Sources; Man-Made Sources; Effects in Man; and Acceptability of Risks. They are based on the reports of the United Nations Scientific Committee on the Effects of Atomic Radiation.

Edited by Geoffrey Lean, this paperback booklet is published by the United Nations Environmental Programme (UNEP), 1985, 64 pp., United Nations Sales Number: E.86.III.D.4. Price US-$10.00, Sw.Fr. 18.–.

Second Edition of Collaborative Study Guidelines

A second edition of the guidelines subtitled 'The Organization of Interlaboratory Studies and a simplified approach to the Statistical Analysis of Collaborative Study Results' (see *CI*, Vol. 8, No. 5, pp. 31–2, 1986) has now been published. Most of the amendments made to the first edition relate to the Annexes.

Quantities, Units and Symbols in Physical Chemistry

An *Abbreviated List of Quantities, Units and Symbols in Physical Chemistry* has recently been published. The list is intended as a ready reference to the symbols most frequently used by authors, teachers and students in chemistry and related disciplines. It will prove to be invaluable as a source of information on the internationally recommended symbols for the most important physical quantities and units used by chemists.

Subjects covered include: Base SI Units and Physical Quantities, SI-Prefixes, SI Derived Units with Special Names and Symbols, Recommended Symbols for Commonly Used Physical Quantities, Units Outside the SI and Values of Some Fundamental Constants.

This list is based on the more comprehensive IUPAC document *Quantities Units and Symbols in Physical Chemistry* to be published in 1987 by Blackwell Scientific Publications.

The list is published by Blackwell Scientific Publications Ltd, Oxford, UK, December 1986. A4 four sides, thick laminated card. Price £1.50. Only available in packs of 10 (£15.00) or 50 (£67.50).

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

Atomic weights of the elements 1985

The biennial review of atomic weight, A_r(E), determinations and other cognate data have resulted in the following changes in recommended values (1983 values in parenthesis): Beryllium 9.012182 ± 3 (9.01218 ± 1); Nitrogen 14.00674 ± 7 (14.0067 ± 1); Fluorine 18.9984032 ± 9 (18.998403 ± 1); Neon 20.1797 ± 6 (20.179 ± 1); Sodium 22.989768 ± 6 (22.98977 ± 1); Magnesium 24.3050 ± 6 (24.305 ± 1); Aluminium 26.981539 ± 5 (26.98154 ± 1); Phosphorus 30.97362 ± 4 (30.97376 ± 1); Chlorine 35.4527 ± 9 (35.453 ± 1); Scandium 44.955910 ± 9 (44.95591 ± 1); Manganese 54.93805 ± 1 (54.9380 ± 1); Cobalt 58.93320 ± 1 (58.9332 ± 1); Germanium 72.61 ± 2 (72.59 ± 3); Arsenic 74.92159 ± 2 (74.9216 ± 1); Yttrium 88.90585 ± 2 (88.9059 ± 1); Niobium 92.90638 ± 2 (92.9064 ± 1); Rhodium 102.90550 ± 3 (102.9055 ± 1); Silver 107.8682 ± 2 (107.8682 ± 3); Cadmium 112.411 ± 8 (112.41 ± 1); Iodine 126.90447 ± 3 (126.9045 ± 1); Xenon 131.29 ± 2 (131.29 ± 3); Caesium 132.90543 ± 5 (132.9054 ± 1); Barium 137.327 ± 7 (137.33 ± 1); Lanthanum 138.9055 ± 2 (138.9055 ± 3); Cerium 140.115 ± 4 (140.12 ± 1); Praseodymium 140.90765 ± 3 (140.9077 ± 1); Europium 151.965 ± 9 (151.96 ± 1); Terbium 158.92534 ± 3 (158.9254 ± 1); Holmium 164.93032 ± 3 (164.9304 ± 1); Thulium 168.93421 ± 3 (168.9342 ± 1); Hafnium 178.49 ± 2 (178.49 ± 3); Gold 196.96654 ± 3 (196.9665 ± 1); Thallium 204.3833 ± 2 (204.383 ± 1); Bismuth 208.98037 ± 3 (208.9804 ± 1); Protactinium has also been assigned a standard atomic weight of 231.03588 ± 2.

These values are incorporated in the Table of Standard Atomic Weights of the Elements, 1985. The Table lists estimated uncertainties U_r(E) between ± 1 and ± 9 in the last tabulated figure in parentheses following the A_r(E) value. Annotations in Tables 1 and 2 have been changed for several of the elements. The Report summarizes those elements of non-terrestrial origin for which variations

in isotopic composition have been found.

This report was prepared by the Commission on Atomic Weights and Isotopic Abundances (II.1) and was published in PAC, *Vol. 58, No. 12, pp. 1677–1692 (1986).*

Extension of Rules A-1.1 and A-2.5 concerning numerical terms used in organic chemical nomenclature (Recommendations 1986)

Numerical terms are used in chemical names for indicating a number of identical structural features in a compound. Rule A-1.1 of the IUPAC Organic Nomenclature Rules illustrates the numerical terms up through 199 in the names of saturated unbranched acyclic hydrocarbons. The use of these numerical terms for expressing identical simple substituents to a parent structure, and their modifications for use with "complex" substitutes, is described in Rule A-2.5.

Recently a desire has been expressed for numerical terms higher than 199. This document provides the necessary guidance, based on principles already established, for generating terms up to 9999 by using the infixes "cta" (for the hundred digits) and "lia" (for the thousands digits) in a way quite analogous to the use of "conta" now used for the tens digits beyond twenty.

This report was prepared by the Commission on Nomenclature of Organic Chemistry (III.1) and was published in PAC, *Vol. 58, No. 12, pp. 1693–1696 (1986).*

Structure and physical properties of high-vinyl polybutadiene rubbers and their blends

Some physical properties of high-vinyl polybutadiene rubber prepared with an alkyl lithium catalyst system were studied in regard to their micro- and macro-molecular structures. It was found that high-vinyl polybutadiene rubbers show characteristic features in the critical properties for tyre tread such as rolling resistance and wet skid resistance: (1) High-vinyl polybutadiene rubbers show high rebound resilience at high temperatures despite the high glass transition temperature. (2) High-vinyl polybutadiene rubbers show the highest value of wet skid resistance at approximately 70% vinyl content. (3) The blends of high-vinyl polybutadiene rubbers with high cis-1,4-polybutadiene, and with high cis-1,4-polyisoprene rubber exhibit an excellent balance of rebound resilience and wet skid resistance. The compatibility for these blends series was also discussed. Finally, it is concluded that high-vinyl polybutadiene rubbers with 70% vinyl content, and its blend compounds are suitable tyre materials for low fuel consumption, because of the excellent balance of low rolling resistance and high wet grip.

This report was prepared by the Commission on Polymer Characterization and Properties (IV.2) and was published in PAC, *Vol. 58, No. 12, pp. 1697–1706 (1986).*

Determination of chromium in biological materials

The determination of chromium in biological materials is of considerable importance because it has been shown to be essential by animal experiments and has potential importance in human medicine. At higher levels it is also toxic and symptoms of chromium toxicity are well established. Numerous errors have appeared in earlier analytical measurements of chromium because analysts have paid too little attention to potential sources of contamination, and to the stringent requirements of particular instrumental measurements. As a result of recent studies, a clearer understanding of the nutritional requirements for chromium, and of the levels of chromium in the serum and urine of normal subjects is available. Recent developments in technology have provided analytical techniques with sufficient sensitivity for both these determinations, although serum chromium at the lowest levels is still a difficult determination for routine hospital laboratories without specialized facilities. Recent developments in analytical techniques are reviewed in the light of clinical requirements both now and in the foreseeable future.

This report was prepared by the Commission on Microchemical Techniques and Trace Analysis (V.2) and was published in PAC, *Vol. 58, No. 12, pp. 1707–1720 (1986).*

Thermodynamic functions of transfer of single ions from water to nonaqueous and mixed solvents: Part 4 — The selection of extrathermodynamic assumptions

The selection of an extrathermodynamic assumption for the division of standard thermodynamic functions of transfer of electrolytes from a reference solvent to other solvents is discussed. Reasons for choosing water as the reference solvent are given. Advantages and drawbacks of approaches concerning the Gibbs energy of transfer: real potentials, negligible liquid junction poten-

tial, electrostatic models, extrapolation methods, reference ion, reference ion/molecule redox couple, and reference electrolyte, are discussed. The least objectionable is the last one, with tetraphenylarsonium (or-phosphonium) tetraphenylborate as the reference electrolyte. This has the additional advantage that it can be applied also to enthalpy and entropy of transfer data.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and was published in PAC, *Vol. 58, No. 12, pp. 1721–1736 (1986).*

Quantities and units in clinical chemistry: Nebulizer and flame properties in flame emission and absorption spectrometry (Recommendations 1986)

A classification of quantitative concepts, a unification of nomenclature, and suggestions for the introduction and implementation of recommended units for quantities relating to the nebulizer and flame components of emission and absorption spectrometers are presented. The purpose is to provide users of this form of instrumentation for clinical chemical determinations with a complete, systematic description of the quantities involved in the use of the instruments, so that the data generated from such instruments for patient care purposes is applied correctly. For all quantities listed, the kind of quantity, the symbol for the kind of quantity and a practical unit, the systematic name, the system and the component, and the definition of the quantity are given. Nebulizer quantities defined include the minimum nebulization time, to ensure the analysis provides data of required precision, the efficiency of nebulization and of atomization, and the fractions of a component desolvated, volatilized and atomized are distinguished. Flame properties defined include temperature, observation height, path length and volume, and the time taken for the component to travel through the flame compared to the observation space are characterized. Finally, quantities for gas flow rates through the flame are listed.

This report was prepared by the Commission on Quantities and Units in Clinical Chemistry (VII.2) and was published in PAC, *Vol. 58, No. 12, pp. 1737–1742 (1986).*

Newsletters & Bulletins

IUPAC Committee on the Teaching of Chemistry (CTC)

International Newsletter on Chemical Education, No. 25, June 1986. This newsletter now has a new editor, P. J. Towse, who succeeds Prof. David Waddington who recently retired as Chairman of CTC. This issue has articles on science projects in Southern Africa and Indonesia; low-cost equipment for chemical laboratories; chemistry in Puerto Rico; A Kenyan laboratory for computer applications in chemistry and the use of 'Because . . .' in chemistry teaching.

Association of Official Analytical Chemists (AOAC)

Journal, May/June, Vol. 69, No. 3. A substantial part of this issue is devoted to the second International Harmonization Symposium which took place in Washington, DC, USA, 25–27 October 1984. This Symposium was dedicated to Dr Harold Egan, the initiator of the harmonization programme, who died on 28th June 1984. His introduction entitled "Method Validation: The Harmonization of Collaborative Analytical Studies" is published as a first paper of the symposium.

The Referee, Vol. 10, No. 1 (August) and **No. 2 (September) 1986** include the usual news and highlights of AOAC activities, methods, awards and publications.

ICSU Committee on Data for Science and Technology (CODATA)

CODATA Newsletter, No. 37, July 1986. Highlights of this issue include reports on the IUPAC Working Party on Biophysical Chemistry (see also *CI*, Vol. 8, No. 3, pp. 2–3, 1986); activities of the Chinese National Committee for CODATA and a CODATA workshop on environmental data quality.

International Organization for Standardization (ISO)

ISO Bulletin, No. 7, July 1986 has an article on electronic publishing and details of the new ISO Standards Handbook 30 *Non-ferrous metals*. **No. 8, August 1986** will be of interest to chemists concerned with the manufacture of cars and related safety standards. There is also an item on standards for low-cost housing in developing countries. **No. 9, September 1986** includes an article on

specification and performance in building standards and details of the Central ISO Secretariat in Geneva. The latter contains an organization chart which is almost as complicated as IUPAC's (see *CI*, Vol. 8, No. 1, p. 27, 1986). There is also a circular item on the 17th World Standards Day (14 October 1986).

European Photochemistry Association (EPA)

EPA Newsletter, No. 27, July 1986 features the IUPAC Commission on Photochemistry: "Glossary of Terms Used in Photochemistry, Part III Symbols Defined in the Glossary." There are also reports on the 1985 Beijing International Conference on Photochemistry and the 7th Course of the International School of Atomic and Molecular Spectroscopy: Spectroscopy of Solid-State Laser-Type Materials held in Erice, Italy, 1985. The issue also contains technical reports on "Photocatalytic Water Cleavage — A Simple Device for H_2-Measurement" and "The Time Structure of Synchrotron Radiation as an Experimental Tool for Versatile Time-Resolved Measurements."

International Union of the History and Philosophy of Science

Newsletter, No. 2, 1985 and **No. 1, 1986** are both concerned with studies of the history of science and technology in India. They include lists of publications and recent projects on this topic.

International Astronomical Union (IAU)

IAU Information Bulletin, 56, August 1986 looks forward to the 20th IAU General Assembly in Baltimore, USA, August 1988. There are also reports from various IAU Commissions and the International Halley Watch.

International Federation of Clinical Chemistry (IFCC)

IFCC News, No. 42, 1986/2. "Clinical Chemistry Below Sea Level" is the headline in this issue of IFCC News. It refers to the 13th International Congress of Clinical Chemistry to be held in The Hague in June/July 1987. A report entitled "The Winds of Change" refers to the 2nd General Conference of the IFCC, Rungstedgaard, Denmark, May 1986.

International Union of Food Science and Technology (IUFoST)

IUFoST Newsletter, No. 14, June 1986 reports the establishment of the General Foods World Food Prize worth US-$200 000 to be made annually. There are also details of various food symposia.

International Association on Water Pollution Research and Control (IAWPRC)

IAWPRC Newsletter, No. 2, 1986. 1987: Around the world in 20 conferences (on water of course) — Watermatex 87; environmental risk assessment of chemicals — fate and effects of chemicals in the environment; arctic pollution and American progress in wastewater reuse are all topics appearing in this issue. **No. 3, 1986** features a report on recommended notation for wastewater treatment processes; wastewater treatement plant review and the IAWPRC's 1988 biennial conference in Brighton, UK.

Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS)

BIOMASS Newsletter, Vol. 8, No. 1, July 1986 has news on BIOMASS data analysis workshops, krill physiology and biochemistry, and various SCAR and SCOR acitivities (SCAR and SCOR are ICSU scientific committees on antarctic research and oceanic research respectively).

International Programme on Chemical Safety (IPCS)

Sentinel: Health and Environment International, Vol. 3, No. 1, July 1986 informs us that plants provide warnings about pollution and that pesticides are a 'growing' concern. "Economic advances in developing countries — what is the cost?" is also a question raised in this issue and there is an item on chemical safety for African countries.

United National Environmental Programme (UNEP)

Industry and Environment, Vol. 8, No. 4, October, November, December 1985 features "The food processing industry and the environment with emphasis on palm oil production". There are also articles on the Danish experience of treating dairy wastewater in developing countries; new technology for processing animal blood and its fractions; recent developments in the utilization of meat and fish wastes in the tropics and biotechnology for the processing of pineapple waste.

Environment Liaison Centre (ELC)

Ecoforum, Vol. 11, No. 2, April 1986 provides African Development Bank analyses of Africa's

economic situation and also contains an item on African machineries to promote women's participation in development. **No. 3, June 1986** looks at the rise and fall of fishery including "Nile Perch: A boon or ecological disaster?" and "Imagine that you are a fish . . . You are living in water, in which people throw their waste and poisons. They do not care about you. Even worse, people burn more and more oil and coal, and blow sulphur dioxide into the air. It falls down with rain, acid rain. It pollutes the water. You get no children any more . . . and you die."

Ecoforum: News Alert, Vol. 3, No. 2, May 1986 has an article on how to manage projects financed by donors.

Conferences

Chemical accidents

The Scientific Group on Methodologies for the Safety Evaluation of Chemicals (SGOMSEC), the joint project of SCOPE* and the International Programme on Chemical Safety (UNEP/WHO/ILO), is preparing for an international workshop to be held in Delhi, India, on 27 January–2 February 1987, as a major event within the framework of the SGOMSEC 6 project on Chemical Accidents. The project is aimed at evaluating and improving the methodologies available for the assessment and reduction (mitigation) of injury to man and non-human and ecosystems, in chemical accidents.

Chemical accidents are low-frequency, but highly significant events in terms of loss of lives, health injuries, environmental impact, material damage. They may occur in process, energy-related and transport activities. They are generally associated with either large inventories of flammable, explosive or very reactive substances or of common toxic chemicals in process industries or smaller quantities of very toxic and persistent chemicals.

The frequency and severity of these accidents seems to have increased during the last few years (Seveso, Mexico, Bhopal, etc). This may be related to the development of the chemical and petrochemical industry, the diversification of derived products, the increase in the size of plants, storage and carriers, the progressive industrialization in developing countries, the vicinity to plants of densely populated areas.

Chemical accidents involve a series of events starting with a technical breakdown or human error initiating uncontrollable physical-chemical phenomena, such as runaway chemical reactions, fires, explosions. This is followed by the propagation beyond the plant boundaries of toxic compounds in gaseous or liquid phase or as particulates. Damage may also be caused by the blast of explosions or the heat of fires. Human beings and non-human targets may suffer injury from acute and/or residual exposure in the form of immediate, acute effects or long-term consequences.

Action should be undertaken to prevent the occurrence of such accidents through the introduction of safer process technologies, the improved performance of safety devices, or through the reduction of human error. Once an accident occurs, engineering systems (scrubbers, flares, venting systems, etc.) should intervene to mitigate its consequences. Post-accident management must be aimed at minimizing injury to man and the environment. This involves as a pre-requisite an accurate assessment of the damage to be expected.

Recently, a number of national and international projects have addressed various aspects of the problem of chemical accidents. The present SGOMSEC project focuses on the methodologies which can be used to assess and reduce injury to man and other biota, as well as ecosystems, following a chemical accident. Accidents involving ionizing radiation alone and oil spills in the marine environment are excluded from consideration as they have been extensively covered in other reports and studies. These methodologies are to be reviewed critically and research needs identified to improve and shorten disaster response time and to improve assessment of extent and probable spread of toxicants by transport through air, aquatic systems and soils. In addition, an attempt is made to use information from past acccidents to improve the methodologies of loss reduction.

In devising a strategy to manage a chemical accident, a multi-phase action plan may be envisaged. Phase 1 would aim primarily at ensuring survival of exposed humans with minimization of both short-term effects and later consequences. This implies also a consideration of behavioural

*SCOPE	(ICSU) Scientific Committee on Problems of the Environment
ICSU	International Council of Scientific Unions
UNEP	United Nations Environment Programme
WHO	World Health Organization
ILO	International Labour Organization

responses of the public. Phase 2 involves a more careful assessment of potential spread, fuller search for the presence of multiple contaminants and identification of potential scope of ecological injury. Phase 3 would include the development of registers for follow-up purposes and the establishment of ecological zones under threat and surveillance schedules to follow the movement and transfer of chemicals in air, water and soils.

It is anticipated that, while not constituting a manual for chemical accident managment, the report to be prepared after the SGOMSEC 6 workshop in Delhi will provide a critical information basis to help those in the public authorities and industry who have to deal with such emergencies. Recommendations for such urgent research needs will be identified to guide Research and Development funding agencies in the public and private sectors.

Extracted from SCOPE Newsletter, *No. 26, September 1986, pp. 3–4.*

Chemical engineering

The 2nd European Conference on Chemical Engineering Education will take place in Cambridge, UK, 14–16 April 1987. *Further information from Conference Section, IChemE, 165–171 Railway Terrace, Rugby CV21 3HQ, UK.*

The topic of Chemical Engineering Fundamentals 1987 (CEF 87) is The Use of Computers in Chemical Engineering. The event, which is being prepared and organized by the Italian Association of Chemical Engineering (AIDIC), will be held in Taormina, Sicily 26–30 April 1987. *Further details from CEF 87, EniChem, Direzione Centrale Ricerca e Sviluppo, Attn. Dr P. Schwarz, Piazza Boldrini, 1, I-20097 San Donato Milanese, Italy.*

Is there a rational approach?

The Association of Official Analytical Chemists (AOAC) will hold its 1987 Spring Training Workshop in Ottawa, Canada, 27–30 April 1987. The highlight of the event will be a two-day microbiology symposium on "Food- and Water-Borne Disease Investigation — Is There a Rational Approach?". Other workshop sessions will focus on chemical analysis of vitamins and nutrients, food additives, mycotoxins, drugs, trace metals, pesticides, veterinary antibiotics, and environmental contaminants; and on immunassay, robotics, and chemometric techniques. There will also be a full two-day poster session on all aspects of analysis and a scientific equipment exposition of 30 exhibitors displaying the latest in laboratory equipment and supplies. *For further information contact Graham MacEachern, Agriculture Canada, Laboratory Service Building 22, Central Experimental Farm, Ottawa, Ontario, Canada K1A-OC5. Tel: (613) 994–1991.*

IUPAC-Sponsored Conferences

CHEMRAWN VI: Advanced Materials for Innovations in Energy, Transportation and Communications

CHEMRAWN VI is the 6th of the series of IUPAC conferences on CHEMical Research Applied to World Needs. The conference, which is being organized by the Science Council of Japan and the Chemical Society of Japan will be held 17–22 May 1987, in Tokyo, Japan.

CHEMRAWN VI has the following objectives:

1. To clarify the role and limitations of advanced materials in technological innovation.
2. To clarify the impact of technological innovation resulting from the use of advanced materials and to analyse their effects upon social and economic affairs in both developed and developing countries.
3. To clarify the role of chemistry and chemical technology in development of advanced materials.

The programme of the conference is divided into three sessions (see box). There will also be poster sessions. The official language of the conference

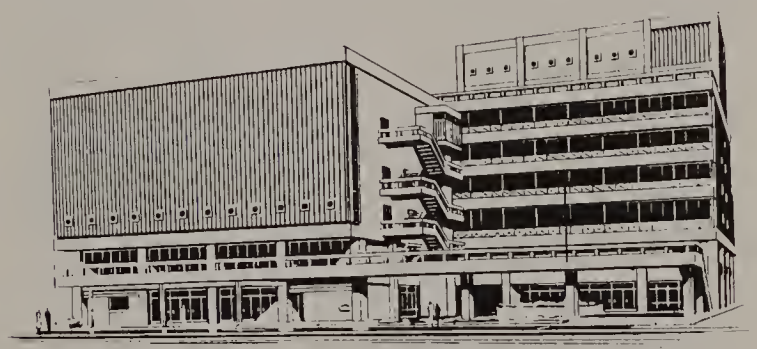
Prof. Saburo Nagakura, Chairman of the CHEMRAWN VI Organizing Committee and President of IUPAC 1981–83.

Plenary lecturers at CHEMRAWN VI: (left to right) Prof. K. H. Büchel (who recently retired as Chairman of the IUPAC Committee on Chemistry and Industry — COCI), Sir George Porter (President of the Royal Society) and Prof. C. N. R. Rao (President of IUPAC).

will be English. The registration fee of the conference is US-$250 for active participants.

The conference will take place in the Nippon Toshi Center Hall which is located in central Tokyo near the Imperial Palace. Tokyo is well provided with accommodation for visitors. The organizing committee has already made tentative hotel reservations for overseas participants. The committee is also planning a number of social events and general interest programmes, including technical tours to visit high-tech firms, institutions and Tsukuba science city. The "High-Tech Materials Exhibition 1987" will also be held in Tokyo at the same time. It is one of the largest international exhibitions on advanced materials.

The conference occurs in the best season for sightseeing in Japan. Visitors can make day trips to Nikko with its famous shrine and scenic view of Kegon Fall; to Hakone which is a spa and has a



Nippon Toshi Center, venue of CHEMRAWN VI

Scientific Programme

Plenary Session: Impact of Technological Innovation

1. Energy materials and human life	Sir George Porter (UK)
2. Advance technology materials; problems and challenges in developing countries	Prof. C. N. R. Rao (India)
3. Economic developing plan and high technologies in China	Prof. Gu Yijian (China)
4. European approach to advanced materials for innovations	Prof. K. H. Büchel (FRG)
5. Roles of advanced materials in the technological innovations	Dr R. C. Forney (USA)
6. Future prospects in aeronautics technologies	Dr J. C. Fletcher (USA)
7. Outlook of information and communication technologies and impact to the human society	Dr T. Sekimoto (Japan)

CHEMRAWN VI

Energy Session:
- Energy generation and materials
- Energy conversion, storage and materials
- Key materials for future energy systems

Transportation Session:
- Space and materials
- Aeronautics and materials
- Surface transportation and materials
- Materials for transportation

Communications and Information Session:
- Key technologies in electronics
- Microelectronics
- Optoelectronics
- Peripherals
- New materials for electronics

Closing Session:
- Science and technology towards the 21st century and role of chemistry to the human society

beautiful view of Mt Fuji and to Kamakura which is an ancient capital of the Shogun era, and it takes about three hours by Shinkansen the Super Express to reach Kyoto and Nara from Tokyo.

Further information about CHEMRAWN VI can be obtained from:

CHEMRAWN VI Coordinating Office,
The Chemical Society of Japan,
1-5, Kanda-Surugadai,
Chiyoda-ku,
Tokyo 101,
Japan.
Tel: 03-292-6161; telex: 222-6198 CSJ J; fax: 03-292-6087.

The Double Bridge of the Imperial Palace — one of the many attractions in Tokyo — if participants have time!

8th International Symposium on Organosilicon Chemistry
St Louis, Missouri, USA, 7–12 June 1987

The scientific programme of this symposium will include three plenary lectures, invited lectures for most of the session topics, short oral presentations and poster presentations, and five-minute summaries of posters. The plenary lecturers are:

L. A. Paquette (USA)
H. Sakurai (Japan)
D. R. Weyenberg (USA)

Invited lectures and sessions will be presented in each of the following:

- Silicon-assisted organic synthesis
- Organic chemistry of silicon
- Silicon in living systems
- Silicon reactive intermediates
- Silicon–silicon chemistry
- Silicon–oxygen polymers and materials
- Inorganic chemistry of silicon
- Silicon in solid state technology
- Analytical chemistry
- Physical chemistry, theoretical studies and spectroscopy

Poster sessions will also be an important integral part of the technical programme. All scientific sessions of this symposium will be held on the campus of Washington University. The official language of the symposium is English. Simultaneous translation facilities will not be available.

Registration fees for participants are as follows: Active participants: US-$150.00 (US-$200.00 after 1 March 1987); postdoctorates and students: US-$60.00 (US-$75.00 after 1 March 1987); associate participants: US-$50.00 (US-$60.00 after 1 March 1987) and for one-day, on-site registration: US-$40.00. The registration fee for active participants covers attendance at all technical sessions of the symposium, a copy of the book of abstracts of papers and related symposium publications, tickets to attend reception (Sunday) and the Farewell Party (Friday).

Housing reservations and hotel reservations for the participants and their family members will be made by the Symposium Secretary. The Washington University residential campus sits on forty wooded acres directly across the street from the academic campus. Early June in St Louis should provide mild summer weather with day time temperatures reaching the mid-80s(F), about 30°C, and night time temperatures in the mid-60s(F), about 20°C. Rain showers do occur during this time of year but are usually brief.

31st International Macromolecular Symposium
Merseburg, GDR, 30 June–4 July 1987

This symposium will be held at the "Carl Schorlemmer" Technical University. It will offer macromolecular scientists from all over the world an opportunity to present and discuss recent results, and exchange ideas for further progress. The scientific programme of this symposium is intended to cover all aspects of polymer science. It will include eight microsymposia on the following topics:

Synthesis of polymers
Modification of polymers
Natural polymers
Structure and properties of polymers
Phase equilibria
Materials and technology
Special use of polymers
Biomedical application of polymers

In each microsymposium there will be two plenary

Merseburg Cathedral with its cloisters in the foreground.

lectures and four invited lectures presenting recent developments. The microsymposia will also include contributed papers, some of which will be presented orally and others in the poster sessions.

The symposium will take place in the university buildings. The official language for presenting contributions is English. The registration fee will be US-$250 for scientific participants. Accommodation for participants and accompanying persons will be provided in university halls of residence a few hundred metres from the lecture rooms.

The "Carl Schorlemmer" Technical University is a campus university situated on the outskirts of Merseburg. Carl Schorlemmer was a German chemist who worked in England for a long time. He is one of the founders of modern organic chemistry. The 150th anniversary of his birthday was celebrated in 1984.

Research and training at the university, which was founded in 1954, is primarily determined by the needs of chemical industry. The university contributes to basic and applied research in selected science disciplines with special emphasis on polymer processing, petrol processing, and the production of highly refined chemical products. In the fields of polymer sciences and polymer processing the areas of research include structure of high polymers, microstructure during the polymerization process, phase equilibria, application of new monomers, inhibitors and stabilizers. Research is also carried out on the production of special polymers and their properties, their compounds and their reinforcement.

The town of Merseburg is more than 1000 years old and situated on the left bank of the Saale river, about 30 kilometres from Leipzig and 15 kilometres from Halle. In the early Middle Ages Merseburg developed into one of the most important imperial residences of Germany. King Heinrich I built his residence here, and Emperor Otto I founded the Merseburg diocese in 968. "Merseburger Zaubersprüche" (Incantations), one of the oldest German linguistic monuments with pure heathen character, are preserved in the cathedral which was built during the reign of Emperor Heinrich II. The cathedral together with the Renaissance Castle founded by Bishop Tilo von Trotha are amongst the most impressive architectural monuments in Germany. An organ concert in the cathedral is included in the symposium programme.

The recent history of Merseburg is closely connected with the Leuna-Werke (formerly "Ammoniakwerke Merseburg") in which the first-ever plant for producing ammonia was built and also with the production of synthetic rubber in the Buna-Werke nearby. Today, Merseburg is an industrial and university town of about 60 000 inhabitants. It has many historic buildings and numerous leisure facilities.

In addition to the scientific programme, several excursions for accompanying persons and post-symposium tours have been arranged. These include a visit to the birthplace of Handel in Halle and excursions to Weimar, where Goethe and Schiller lived and worked, and Wittenberg which is famous for its association with Martin Luther.

◀ Prof. Margit T. Ratzsch, President of the "Carl Schorlemmer" Technical University of Merseburg, Local Chairman of the Scientific Committee of the Merseburg Symposium and Titular Member of the Commission on Thermodynamics.

Prof. B. Philipp, ▶ President of the Chemical Society of GDR and Scientific Chairman of the Scientific Committee.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1987

Porous Solids

26–29 April. International Symposium on Characterization of Porous Solids. Bad Soden, Nr. Frankfurt, FRG.
(Attn: Mrs C. Birkenberg, DECHEMA, PO Box 970146, D-6000 Frankfurt/Main 97, Federal Republic of Germany.)

Quantitative Luminescence Spectrometry

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan.
(CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–23 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanisms. Santa Margherita Ligure, Nr. Genoa, Italy.
(Prof. Savgerio Russo, C.N.R. Center on Macromolecules, Corso Europa 30, I-16132 Genoa, Italy.)

High Temperature and Energy-Related Materials

25–29 May. 5th International Conference on High Temperature and Energy-Related Materials. Rome, Italy.
(Prof. G. De Maria, Dipartimento di Chimica, Università di Roma "La Sapienza". P. le Aldo Moro, 5, 00185 Roma, Italy.)

Organosilicon Chemistry

7–12 June. 8th International Symposium on Organosilicon Chemistry. St. Louis, Missouri, USA.
(Prof. Peter P. Gaspar, Department of Chemistry, Washington University, St Louis, Missouri 63130, USA.)

Boron Chemistry

22-26 June. 6th International Conference on Boron Chemistry. Bechyne, near Tabor, Czechoslovakia.
(Dr S. Hermanek, Institute of Inorganic Chemistry, Czechoslovak Academy of Sciences, 250 68 Rez near Prague, Czechoslovakia.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule "Carl Schorlemmer", Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands.
(Prof. J. Reedijk, State University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria.
(31st International Congress of Pure & Applied Chemistry, Centre of Chemistry, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Block 11, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Kobe, Japan.
(Prof. Michio Kobayashi, Secretary, ICHAC-1987, c/o Kinki Chemical Society, 1-8-4, Utsubo-Honmachi, Nishiku, Osaka 550, Japan.)

Macrocyclic Chemistry

20–23 July. 12th International Symposium on Macrocyclic Chemistry. Hiroshima, Japan.
(Prof. Eiichi Kimura, Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine , Kasumi 1-2-3, Hiroshima 734, Japan.)

Organometallic Chemistry

26–30 July. 4th International Symposium on Organometallic

Chemistry Directed Towards Organic Synthesis (OMCOS IV). Vancouver, BC, Canada. (Prof. Michael D. Fryzuk, Department of Chemistry, The University of British Columbia, 2036 Main Hall, Vancouver, British Columbia, Canada V6T 1Y6.)

Chemical Education

26–31 July. 9th International Conference on Chemical Education. Sub-title: 'Chemistry for our New World'. São Paulo, Brazil. (Prof. Ernesto Giesbrecht, Instituto de Quimica, Universidade de São Paulo, Caixa Postal 20.780, 01498-São Paulo, SP, Brazil.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China. (Prof. Xiao-Zeng You, Conference Secretary, XXV ICCC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany. (Prof. J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Cationic Polymerization

10–14 August. 8th International Symposium on Cationic Polymerization and Related Processes. Munich, FRG. (Prof. Oskar Nuyken, Lehrstuhl I für Makromolekulare Chemie, Universität Bayreuth, D-8580 Bayreuth, Federal Republic of Germany.)

Theoretical Organic Chemistry

12–19 August. World Congress of Theoretical Organic Chemists. Budapest, Hungary. (E. A. Lang, WATOC CONGRESS, Hungarian Chemical Society, H-1061 Budapest, Anker Köz 1, Hungary.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark. (Prof. Philippe Grandjean, Department of Environmental Medicine, Institute of Community Health, Odense University, J. B. Winslows Vej 19, DK-5000 Odense C, Denmark.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria. (6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan. (Prof. Kazuo Akashi, Dept. of Metallurgy & Materials Science, Faculty of Engineering, The University of Tokyo, 7-3-1, Hongo, Bunkyoku, Tokyo 113, Japan.)

CHEMRAWN IV

4–9 October. "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources". Colorado, USA. (Dr Derek W. Spencer, Associate Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan. (Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1-5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Reduced conference fees for Affiliates

Organizers of the following conferences have agreed to a 10 per cent reduction in Conference fees for Affiliates:

- International Symposium on Characterization of Porous Solids (Bad Soden, Nr. Frankfurt, FRG, 26–29 April 1987)
- 2nd International Symposium on Quantitative Luminescence Spectroscopy in Biomedical Sciences (Ghent, Belgium, 11–14 May 1987)
- 6th International Meeting on Boron Chemistry (Bechyne, Czechoslovakia, 22–26 June 1987)
- 31st International Symposium on Macromolecules (Merseburg, GDR, 30 June–4 July 1987)
- International Conference on Heteroatom Chemistry (ICHAC-1987) (Kobe, Japan, 19–24 July 1987)
- 9th International Conference on Chemical Education. Subtitle: 'Chemistry for our New World' (Sao Paulo, Brazil, 26–31 July 1987)
- 25th International Conference on Coordination Chemistry (Nanjing, China, 26–31 July 1987)
- 8th International Symposium on Solute–Solute–Solvent Interactions (Regensburg, FRG, 9–14 August 1987)
- World Congress of Theoretical Organic Chemists (Budapest, Hungary, 12–19 August 1987)
- 2nd Nordic Symposium on Trace Elements in Human Health & Disease (Odense, Denmark, 17–21 August 1987)

Workshop

- 2nd International Workshop on Behaviour of Pollutants in Porous Media (Bet Dagan, Israel, 14–19 June 1987)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubere, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-les-Nancy Cédex, France.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical And Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, Institute of Macromolecular Chemistry, Czechoslavak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia).

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto, 606 Japan.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Natori, Maiji College of Pharmacy, 1-22-1, Yatocho, Tanashi-shi, Tokyo 188, Japan.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

1990

Organic Synthesis

June. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

WORKSHOPS

1987

Pollutants in Porous Media

14–19 June. 2nd International Workshop on Behaviour of Pollutants in Porous Media. Bet Dagan, Israel.
(Dr Zev Cerstl, Institute of Soils and Water, Volcani Center, ARO, PO Box 6, Bet Dagan 50-520, Israel.)

Vapor–Liquid Equilibria

9–10 September. 3rd International Workshop on Vapor–Liquid Equilibria in *l*-Alkanol + *n*-Alkane Mixtures. Budapest, Hungary.
(Dr H. V. Kehiaian, Laboratoire de Chimie Organique Physique, Institut de Topologie et de Dynamique des Systèmes, Université Paris VII — C.N.R.S., 1 rue Guy de la Brosese, F-75005 Paris, France.)

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International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

National Adhering Organizations

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
Asociación Química Argentina **(Argentina)**
Australian Academy of Science **(Australia)**
Verein Österreichischer Chemiker **(Austria)**
Comité National Belge de Chimie **(Belgium)**
Bulgarian Academy of Sciences **(Bulgaria)**
National Research Council of Canada **(Canada)**
Chinese Chemical Society, Beijing and Chemical Society located in Taipei **(China)**
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Det Kongelige Danske Videnskabernes Selskab **(Denmark)**
Deutscher Zentralausschuss für Chemie **(Federal Republic of Germany)**
Suomen Kemian Seura **(Finland)**
Comité National Français de la Chimie **(France)**
Akademie der Wissenschaften der DDR **(German Democratic Republic)**
Association of Greek Chemists **(Greece)**
Hungarian Academy of Sciences **(Hungary)**
Indian National Science Academy **(India)**
Iraqi Chemical Society **(Iraq)**
Royal Irish Academy **(Ireland)**
Israel Academy of Sciences and Humanities **(Israel)**
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Science Council of Japan **(Japan)**
Institut Kimia Malaysia **(Malaysia)**
Koninklijke Nederlandse Chemische Vereniging **(Netherlands)**
Royal Society of New Zealand **(New Zealand)**
Norsk Kjemisk Selskap **(Norway)**
Sociedad Química del Perú **(Peru)**
Polska Akademia Nauk **(Poland)**
Sociedade Portuguesa de Química **(Portugal)**
Korean Chemical Society **(Republic of Korea)**
Council for Scientific and Industrial Research **(Republic of South Africa)**
Academia Republicii Socialiste România **(Romania)**
Consejo Superior de Investigaciones Científicas **(Spain)**
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Chemistry International

IUPAC

1987, Vol 9, No 1 (January)

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Front cover: Apollo 10 view of the Earth from 36 000 nautical miles. (*Photo courtesy NASA.*)

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Editorial

Young chemists and women chemists in IUPAC

In October 1985, at the instigation of its Executive Board, the International Council of Scientific Unions (ICSU) held a special three-day conference at Schloss Ringberg, Tegernsee (FRG) to examine ICSU's contemporary and future role in international scientific cooperation (see *CI*, Vol. 7, No. 4, p. 42, 1985).

One of the outcomes of the Ringberg Conference was a recommendation encouraging ICSU and its member organizations to "involve more young scientists and more women scientists in their activities".

ICSU's Executive Board set up a small group to coordinate the follow-up. This group requested the ICSU Secretariat to obtain from the International Scientific Unions and from the various ICSU Committees statistics concerning the number of young scientists (below 40) and women scientists who are involved in their work.

IUPAC does not keep statistics on dates of birth of members of IUPAC bodies and so it was impossible to supply ICSU with any data concerning the numbers of young chemists, male or female, below the age of 40. However, IUPAC did point out that one of the ideas of its Affiliate Membership Scheme, launched in 1986, was to involve more young chemists in its work. Indeed, this is the first principle of Ourisson's Law (see p. 67).

The third principle of Ourisson's Law states that when choosing international experts for their tasks, IUPAC Commissions should give preference to women rather than men — all other things being equal. There can be no doubt that IUPAC has made some — albeit a little — movement in this direction. For the first time in the history of the Union, the Bureau has a woman member: Dr Mary Good. Mary Good is also Past-President of the Division of Inorganic Chemistry and a member of the Executive Committee. Prof. Irine Beletskaya is Secretary of the Organic Chemistry Division Committee and thus in line eventually for its Presidency. Prof. Ludmila Golovleva, who describes a typical day in her life in this issue (p. 48) is a Titular Member of the Commission on Pesticide Chemistry. Dr Anne Alper, a recent visitor to the IUPAC Secretariat in Oxford (see p. 46), is the new Executive Director of the Canadian Institute of Canada and Secretary of the Canadian National Committee for IUPAC.

These are all hopeful signs, although a closer inspection of IUPAC membership reveals that they are almost certainly inadequate. In April 1986, in response to the ICSU request for statistics, a count of the memberships of IUPAC's Commissions and Committees showed that only 63 members were women — out of a total membership of about 1500! Other Unions and ICSU Committees provided similar evidence of the relatively low level of involvement of women scientists in their activities.

The Ringberg Conference Follow-up Group held its final meeting in Paris in May last year. It recommended that the participation of young scientists and women scientists in ICSU activities should be increased. The recent 21st General Assembly of ICSU (see pp. 54–62) endorsed this recommendation and encouraged members of ICSU to include young scientists and women scientists as nominees for the posts of Officers and National Representatives to the General Committee. Furthermore, it invited ICSU's Executive Board to appoint more young scientists and women scientists to ICSU Committees and Commissions.

In the light of these recommendations of the ICSU General Assembly the launch of IUPAC's Affiliate Membership Scheme has proved both timely and opportune. At the time of writing this Editorial (86.11.20 — see Editorial in previous issue!) an Affiliate Membership Database is in preparation. By the time you read this Editorial, lists for each Commission showing the name, address, sex, and date of birth of every Affiliate who has expressed an interest in the work of the

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Opinions expressed here are those of the author and do not necessarily reflect the views or policy of IUPAC.

Commission will have been sent to its Chairman. This provides IUPAC, through its Commissions, with a golden opportunity to take a lead role in implementing ICSU's recommendations on the participation of young scientists and women scientists in its activities. Let us hope that when the Commissions meet next — at the Boston General Assembly — they will seize this opportunity.

News & Views

First IUPAC Seminar

◀ Dr G. P. Savage

Dr R. Ingle ▶

In 1983, at its meeting at the General Assembly in Lyngby, Denmark, the IUPAC Council received a proposal from the Federal Republic of Germany's delegation to initiate a programme of 'IUPAC Seminars'. Subsequently a Study Group submitted plans to the Bureau for a two-year trial period starting 1986. A grant from the International Council of Scientific Unions (ICSU) was obtained to help fund these seminars.

One of the major aims of this programme of seminars is to stimulate chemical research and scientific interaction particularly in regions and countries where, for geographical, financial or organizational reasons, full participation in the existing scientific exchange activities is difficult.

The first IUPAC Seminar was held in Papua New Guinea on 11–14 September 1986. The seminar took the form of the Third Annual Congress of the Papua New Guinea Institute of Chemistry (PNGIC). The Congress was held in Goroka Teachers College and its theme was "Chemistry in the Service of Papua New Guinea".

IUPAC–ICSU funds helped enable two plenary lecturers to attend the Congress: Dr R. Ingle, (University of London Institute of Education, UK) and Dr G. P. Savage, (Lincoln College, Canterbury, New Zealand).

Ingle's lecture was entitled "Making school chemistry relevant and interesting to our pupils". He pointed out that a great deal of time and effort had been spent in many countries in the last 20 years in developing new chemistry curricula for use in secondary schools. The benefits have been real and positive, yet in many ways they have failed to measure up to aspirations. It must be admitted, he went on to say, that many young people at school have not seen their study of chemistry as particularly interesting or relevant to them. School chemistry can be both a cognitive and cultural misfit. So we now need, at this time of worldwide economic retranchment, to re-examine our aims and ideals in science education, in the light of recent findings on how young people respond to science.

The use of language and of visual means of communication have enormous potential for helping students to *think* about science. The value of practical work in science is widely accepted, but here too, said Ingle, we need to think out clearly how we can achieve the maximum value for the considerable time and money that is expended on this activity.

Savage spoke on "The chemistry of food — a historical perspective of protein quality". His paper gave a brief historical perspective on the evaluation of food. He described some of his work on the nutritional evaluation of food at Lincoln College. This included extensive chemical analysis of three foods commonly eaten in Fiji: the mung bean, urd and pigeon peas. He also spoke about similar work carried out on the evaluation of lentils and the chemical composition and biological value of meat and bone meal, blood meal and fish meal.

AB

(87.2.16)

"decides it at last"

The Chemical Industry: Where in the World is it Going?

A chemical industry leader viewed the next decade with optimism and confidence whereas a representative of the investment community warned of continued difficulties and challenges to the industry as it faced overproduction, cost factors, more constriction and restructuring. The stage was thus set at a meeting of the World Chemical Congress of Marketing and Business Research at Newport Beach, California, 7–10 September last year. The meeting entitled "The Chemical Industry: Where in the World is it Going?" was sponsored jointly by the American Chemical Society Division of Chemical Marketing and Economics and the Chemical Marketing Research Associates.

The meeting attracted attendees from over 20 countries and covered a range of subjects: world petrochemicals, specialties, chemical technology, plastics, environment, regulations, inorganics, agricultural chemicals, biotechnology, lasers, and many others. Mr Frank Popoff executive vice president of The Dow Chemical Company, keynote speaker, was followed by experts and industry leaders from around the world — industry presidents, representatives of the finance community, technology experts, editors and reporters of trade journals, marketing managers, directors of research and others discussing activities in the USA, Europe, the Pacific area and the rest of the world. Subjects ranged from financial planning, project selection, joint ventures, process acquisition, foreign distribution, manufacturing knowledge, R&D planning and corporate planning.

While there was general recognition that much of the industry faced an "identity" crisis, with continued restructuring, the overall consensus was that the industry recognized that change had been a part of its culture and the key to survival and success would be a combination of enlightened management, technical leadership, innovation, flexible manufacturing, and low cost.

Etcyl H. Blair

Participation of IUPAC Affiliates in 1987 General Assembly

The Union is arranging for a limited number of observers to be considered for admission to the Commission meetings at the 34th IUPAC General Assembly, to be held in Boston, MA, USA, during 21–29 August 1987.

Affiliates who are interested in observing a particular meeting may apply in writing to Dr W. Spindel (Secretary, US National Committee for IUPAC, National Academy of Sciences, 2101 Constitution Avenue NW, Washington, DC 20418, USA), stating her or his professional interest in the work of that Commission.

IUPAC regrets that it is unable to provide any financial support for Affiliates to participate at Boston.

Observer Country status for Nigeria

Nigeria has recently become an IUPAC Observer Country. This followed an application from the Chemical Society of Nigeria. The country was a full member of the Union for several years prior to 1975.

The total number of countries holding Observer Country Status is now 13: Chile, Ethiopia, Hong Kong, Kuwait, Malawi, Nepal, Nigeria, Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka and Thailand.

Observer Country status was introduced to enable small or developing countries to become involved in the Union. An Observer Country is eligible to send an observer to Council meetings — although the observer cannot vote. On payment of an annual service charge, the Observer Country receives basic documentation, *CI* and advance information about IUPAC sponsored conferences.

Verse to be treasured — I

Professor Ram Rao

Professor Ram Rao of great Bangalore
is President IUPAC, a very big score
His thinking is fast,
decides it all last
Attending his meetings is never a bore

Anders Björkman
Treasurer

Albert Einstein Medal

UNESCO's Director-General, Mr Amadou-Mahtar M'Bow, awarded the UNESCO Albert Einstein Medal to Her Royal Highness Princess Chulabhorn of Thailand on 24 October 1986.

Greeting Her Royal Highness at UNESCO Headquarters in Paris, Mr M'Bow stated that the award, created in 1979 to mark the 100th anniversary of Einstein's birth, was offered to the Princess for her "exceptional scientific merit" and for her "continuing action in favour of peace, justice and progress in Asia and throughout the world." The Director-General also noted contributions of Thai scientists in the Princess's own field of natural products chemistry, as well as in microbiology and physics, to UNESCO's basic science network in Southeast Asia.

In accepting the award, Her Royal Highness referred to her own research work on the chemical constituents of eucalyptus oil and on the importance of such work by Thai chemists to the practical development of her country and region. Scientists view UNESCO as having "paved the way" in "harnessing science for the betterment of humankind," she said. The Princess also stated her intention to assist in arranging the Asian co-ordinating group for chemistry meetings in Chiang-Mai early next year. She praised UNESCO for its role in organizing the co-ordinating group.

Princess Chulabhorn of Thailand, winner of the UNESCO Albert Einstein Medal, gained a PhD in organic chemistry in 1985. The Princess lectures in chemistry at Mahidol University and the Royal Thai Air Force Academy. She is also a consultant with the Petroleum Authority of Thailand. Last year, Princess Chulabhorn received the title of Honorary Fellow of the Royal Society of Chemistry (UK).

IUPAC People

New COCI Chairman

Dr D. Wyrsch has been appointed Chairman of the IUPAC Committee on Chemistry and Industry (COCI). He succeeds Prof. K. H. Büchel who became Chairman of COCI when it was set up in 1978 and whose term of office finished at the end of 1986. Dr Wyrsch's address is: Dyestuffs and Chemicals Division, CIBA-GEIGY AG, Postfach, CH-4002 Basel, Switzerland.

Address change

Dr A. Cornish-Bowden (Secretary, JCBN): CNRS-CBM, 31 Chemin Joseph-Aiguier, B.P. 71, 13277 Marseille Cedex 9, France. Tel: +33 91 715780. Telex: 430225 CNRSMAR F. Attn: Cornish-Bowden, Biochimie.

We regret to record the death of:

Prof. J. M. Ottaway, UK (20 October 1986) — Commission on Microchemical Techniques and Trace Analysis (1977–86).

Dr Anne Alper at the IUPAC Secretariat in Oxford recently. Dr Alper is Executive Director of the Canadian Institute of Chemistry and Secretary of the Canadian National Committee for IUPAC.

The IUPAC Secretariat has recently welcomed three new members of staff: Miss Muriel Welch (left) is the new Secretary to the Scientific Publications Secretary, Mr P. Dass Gujral; Mrs Mary Patterson (centre) became Secretary to the Editor of *CI*, Dr Michael Freemantle, in January this year. Miss Marie Kubat (right) is the new Membership Secretary at the Secretariat. Part of her responsibility is the operation of the Affiliate Membership Database.

Affiliates in Thailand

In 1986, IUPAC invited the Chemical Society of Thailand to nominate 10 young chemists to be sponsored as Affiliates. The sponsorship was made possible by grants from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council of Scientific Unions (ICSU).

Amongst the ten nominated was Dr Ratana Seangprasertkij. She received her PhD degree in inorganic chemistry in August 1985 from Miami University, USA and is presently a Faculty Member at Chulalongkorn University, Bangkok. Dr Jumras P. Limtrakul is a full-time lecturer in the Department of Chemistry at Kasetsart University in Bangkok. His research interests include cationic bonding in biomolecules and solution chemistry.

Dr. Sunanta Vibuljan received her PhD in organic chemistry from University College, Cork, Ireland in 1981. She is currently engaged in the synthesis of

◀ **Dr Sunanta Vibuljan**

Dr Piniti Ratananukul ▼

▲ **Dr Jumras P. Limtrakul**

Dr Ratana Seanprasertkij ▶

chiral compounds with structures related to natural compounds at Mahidol University, Bangkok. She is also working on the isolation and identification of compounds occurring in tropical plants which are used in traditional medicine. Dr Piniti Ratananukul is a lecturer in organic chemistry in the Department of Chemistry, Silpakorn University, Nakorn Pathom. His research interests include sulphur chemistry and natural product synthesis.

For further information about the Affiliate Membership Scheme in Thailand contact the National Affiliate Membership Secretary in Thailand: Prof. Kamchorn Manunapichu, President, Chemical Society of Thailand, Faculty of Science, Mahidol University, Rama VI Road, Bangkok, Thailand.

A typical day in the life of Ludmila Golovleva

Prof. Ludmila A. Golovleva is a Titular Member of the Commission on Pesticide Chemistry. At the Pesticide Chemistry Congress in Canada last year, *Chemistry International* asked Prof. Golovleva to describe a typical day in her life.

Ludmila A. Golovleva was born in Gorky in 1939. She graduated from Lomonosov Moscow State University in 1962 and then studied as a postgraduate student at the university until 1966. From 1966 to 1980 she was successively a junior research worker and then a senior worker at the Institute of Biochemistry and Physiology of Microorganisms. In 1979 she became a Doctor of Biology.

Since 1979, Golovleva has been Chief of the Laboratory of Enzymatic Degradation of Organic Compounds, Institute of Biochemistry and Physiology of Microorganisms, Academy of Sciences of the USSR. The institute is located at Pushchino in the Moscow Region.

Prof. Ludmila Golovleva

Golovleva's main fields of scientific research are microbial bioconversion of organic compounds, metabolism and enzymatic degradation of pesticides and xenobiotics, solid-state fermentation of lignocellulosic materials, enzymatic bioconversion of lignin and lignosulfonates.

At the 6th International Congress of Pesticide Chemistry held in Ottawa, Canada, 10–15 August last year (see *CI*, Vol. 9, No. 1, pp. 12–21, 1986), she presented posters on (1) Biotechnology of environment protection against pesticides (2) Microbial degradation of metoxychlor and (3) Fate of pseudomonads carrying biodegradative plasmids in soil. These were presented at the workshop on the "Role of Biotic and Abiotic Degradation". Prof. Golovleva was organizer of this workshop.

Golovleva is author of 125 publications, including the monograph *Microorganisms in Organic Chemistry*, which has been translated into Japanese and Bulgarian. She is a member of the four scientific councils, a member of the Central Council of the All-Union Society of Microbiology, a member of the Scientific Committee on Agricultural Chemistry and a member of the editorial boards of two journals: *Applied Biochemistry and Microbiology* (USSR) and *Journal of Environmental Science and Health* Part B (Canada).

In 1985 Golovleva became a Titular Member of IUPAC's Commission of Pesticide Chemistry. However, her international work is not limited to IUPAC. She is also a member of the International Cell Research Organization (ICRO) Panel on Applied Microbiology and Biotechnology and a member of the Inter-Union Commission on the Application of Science to Agriculture Forestry and Aquaculture (CASAFA).

How then, does Ludmila Golovleva describe a typical day in her life? She normally gets up at 6.30 am and arrives in her laboratory at 8.00 am. She works there, discussing results with co-workers and writing papers until between 6.00 pm and 7.00 pm.

She spends most of her day working in the laboratory and does not have to attend many meetings. She likes to travel although she does not do much of this. In 1985 she attended the IUPAC General Assembly in Lyon and last year she visited Canada to attend the meeting of the Commission on Pesticide Chemistry and the Congress of Pesticide Chemistry. Golovleva is currently coordinator of the Commission's project on "Microbial Conversion of Pesticides".

When asked what she liked to eat and drink during the day she replied "It is my top secret". Golovleva lives in an apartment in the Moscow Region and for relaxation likes to read, cook and work in the garden.

Labelling columns of the long form Periodic Table

Daryle H. Busch

IUPAC's Commission on Nomenclature of Inorganic Chemistry (CNIC) has recommended that the columns of the long form of the Periodic Table be labelled consecutively from left to right with the arabic numerals 1 to 18 (see *CI*, Vol. 7, No. 3, pp. 26–27, 1985). The following statement from CNIC by its Chairman, Prof. Daryle H. Busch, reviews the background and nature of this recommendation.

Common usage — principle of least change

CNIC attempts to be respectful of and sensitive to common usage of such basic conventions as those involving the Periodic Table. In the homelands of Mendeleev and Lothar Meyer, the classic eight-column short form of the table is understandably still widely used. However, most of the countries in Europe, both East and West, use an 18-column table, as do Japan and the USA. CNIC expects that in some countries, use will always be made of the eight-column table. We hope that those users will want to follow the appropriate recommendations which were contained in IUPAC's *Nomenclature of Inorganic Chemistry* (1970), 2nd edn, Butterworths, London, 1971; we call this "The 1970 Red Book." It remains true, however, that common practice throughout most of the world overwhelmingly supports the 18-column format. Therefore, recommendation of that format cannot be an issue. The labelling of the columns is the only issue under discussion here.

History of CNIC/IUPAC Recommendations

In 1970 CNIC and IUPAC endorsed a system for column labelling that followed early precedent for the use of the capital letters A and B to distinguish between the left and right side families of elements. While this practice is in common use in the UK and much of Europe, it has found acceptance only slowly, if at all, elsewhere. Japan has just accepted this practice while the USA has adhered rigidly to the converse use of the A and B labels. This leads to such unpleasant scenarios as a student consulting a book that shows one convention, while the wall chart above him shows the opposite convention. Further, statements in the scientific literature referring to A and B subgroups are all ambiguous except in the presence of either a definition or a well defined context. Thus, an unacceptable conflict in column labelling exists.

Exhaustive discussions have been held by CNIC on various formats and labelling schemes for the Periodic Table and representatives of CNIC have promoted extensive public discussions on the subject through national professional organizations. At the 1982 meeting of CNIC in Paris, it was concluded that use of the 18-column table should be encouraged and that the table would be used in the new Red Book, Part I (a complete rewriting of the basic manual on inorganic nomenclature had begun and is now nearing completion). Further, a majority of the members of CNIC favoured the labelling of the columns consecutively, from left to right, with the arabic numbers 1 to 18. The latter suggestion was offered as a solution to the conflicting use, on opposite sides of the Atlantic Ocean, of the column labels A and B. These conclusions were confirmed by votes at the Copenhagen meeting in 1983, at the St Lambert meeting in 1984, and at the Lyon meeting in 1985. Now, in 1986, CNIC has reconfirmed these conclusions at its meeting in Heidelberg. While it is neither the purpose nor the intent of CNIC arbitrarily to set the format of the Periodic Table to be used in all parts of the world, it is a reasonable mission for CNIC to offer broadly useful solutions when direct conflicts in usage occur.

Discussions by CNIC in Heidelberg 1986

The proposal stated in the preceding paragraph has led to extensive correspondence, both in journals and through private channels. At the Heidelberg meeting of

Recommended format for the Periodic Table of the Elements.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac**															
		*Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
		**Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

CNIC, an attempt was made to evaluate the correspondence on the Periodic Table that was available to CNIC. Least change was most often favoured, with no change being most popular of all. Many would like to retain the equivalent of an A/B system. However, this was not found to be acceptable either because of problems with translation or because of the conviction that disguising the problem fails to solve it.

Critics claim that the new labelling system interferes with teaching. Those relating to the fact that the long form is favoured over the eight-column table were not considered, since CNIC expects that use of the latter format will continue in some places. However, it is not appropriate to give credit to CNIC for the evolved dominance of the 18-column form throughout most of the world.

Otherwise, the main concerns rest on perceived pedagogical impediments, revolving about losses in correlations between column labels and such quantities as positive oxidation numbers and numbers of valence electrons for main group elements. As has been pointed out by a number of correspondents, no problem of this kind actually exists. One need only show the student that for the "teen columns" the *second* digit of the column number corresponds to the number of valence electrons and to the maximum positive oxidation number. One should also recognize that the CNIC recommended numbering scheme also displays a relationship involving the numbers of electrons for the transition elements. Further, the proposed scheme eliminates the irrational (for the long form) lumping together of three families of elements under a single number (old VIII, new 8, 9, 10). In summary, one can teach all that was taught before, plus significantly more, using the proposed labels.

Several correspondents have referred to the use of the roman numerals of the familiar 18-column table in the common parlance of solid state science, e.g. III/V semiconductors. The behaviours of these materials derive from their electronic (and crystal) structures and not from the labels on the columns of the Periodic Table. It is almost universally agreed that one should not try to reproduce electronic structure precisely in the column headings. Again, the second digit of the column heading relates to the electronic structure for *p*-block elements and the notation III/V remains perfectly rational.

Among the more common criticisms are allegations of poor or ineffective communication with regard to the proposed relabelling scheme. CNIC is deeply concerned with this matter. It has been decided that, over whatever length of time is required by appropriate and effective process, ultimate recommendations on the format and labelling of the Periodic Table must be responsive to the user constituency. That constituency ranges from school children to senior scientists and covers such disciplines, in addition to chemistry, as biology, metallurgy, ceramics, solid state physics, and materials science. Each sector of this large population should have the opportunity to seek and present its local consensus. The principal goal of CNIC/IUPAC is to offer the minimum guidance necessary to eliminate conflicting usages. A hopeful result will be to produce the most constructive universal solution to this problem.

Tertiary level chemical education in the GDR

Prof. Gottfried Kempe

In 1975, a unified chemistry curriculum was introduced in the nine universities of the German Democratic Republic (GDR). One of the most important aims of this curriculum was to encourage students' independent creative work. In this review, Prof. Kempe of Technische Hochschule "Carl Schorlemmer", Merseburg and GDR National Representative on the IUPAC Committee on Teaching of Chemistry (CTC) describes the curriculum and its aims.

The German Democratic Republic (GDR) is an industrialized country, in which chemical industry plays a major role. Each year about 500 students are enrolled on chemistry courses at the nine universities and technical universities in the country. A further 300 foreign students — many from Africa, Asia and Latin America — also study at these universities.

Our government attaches great importance to the integrated educational system and encourages teaching staff to improve the quality of education at all levels steadily. Therefore, in 1975, a new unified chemistry curriculum was proposed, widely discussed and introduced in all chemistry departments.[1,2] Its precursor, based on a four-year course, was used from 1970 to

Prof. Gottfried Kempe

1975 but did not meet with success.

In 1980 the first results of putting the new curriculum into practice were carefully examined at a National Scientific Methodical Conference on Chemistry involving teaching staff and students. The results were deemed to be satisfactory.[3]

The following are characteristic features of the present chemistry course (*see* Fig. 1).

- The five-year chemistry course consists of a basic course for all students lasting 2½ years and an advanced course of the same duration in four different branches of chemistry. These are related to the needs of science and economy in our country:
  process chemistry (50%)
  synthetic chemistry (30%)
  theoretical and physical chemistry (15%)
  food chemistry (5%)
  (The numbers in brackets give the percentage of students taking this advanced course).
- In the fourth year, students do a 12-week practical course of industrial training in one of our chemical plants.
- The final or main examination is taken at the end of the fourth year.
- During the last year the student works on his/her diploma thesis. If defence of the results is successful he/she is awarded the first academic degree of a graduated chemist (Diplom-Chemiker)

The basic course

The basic course covers the following topics:

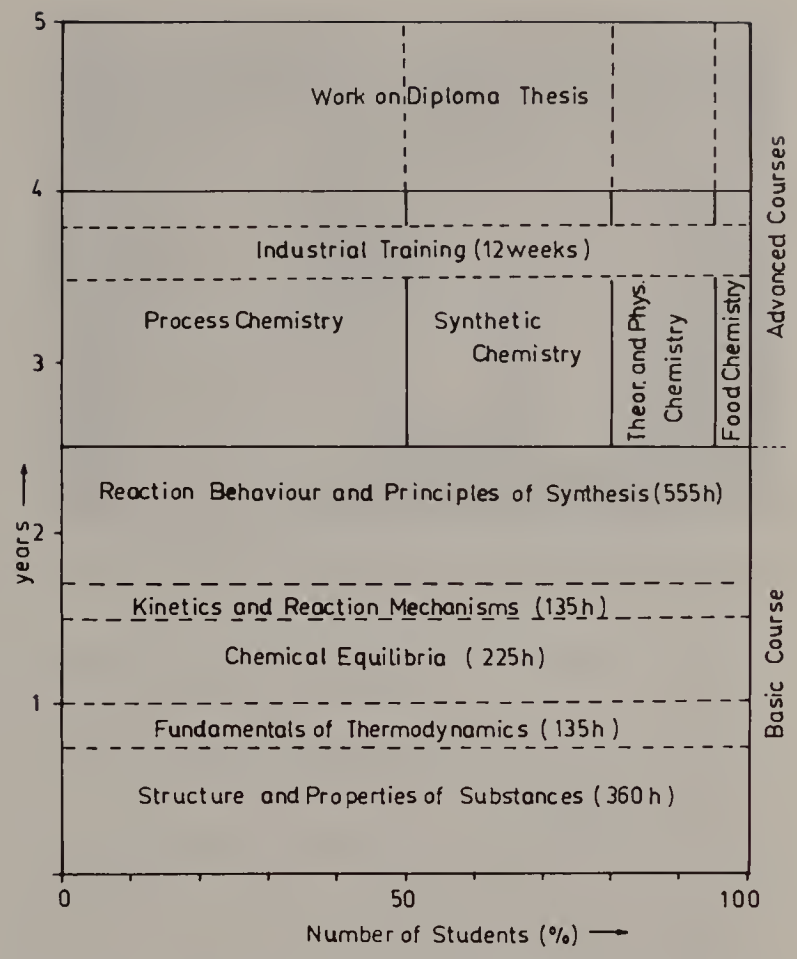
- structure and properties of substances (including basic knowledge of inorganic chemistry, stoichiometry and qualitative analysis)
- fundamentals of thermodynamics
- chemical equilibria (including electrochemistry and quantitative analysis)
- kinetics and reaction mechanisms
- chemical reaction behaviour and principles of synthesis (covering inorganic and organic substances and reactions as well as structure analysis).

Apart from these topics the student has to study the following compulsory subjects: mathematics, physics, social sciences, sports, foreign languages and — more recently — information science and computing. The basic course ends with a final examination on the principles of chemistry.

The basic course thus integrates fundamental knowledge of facts, theories and methods of chemistry. Each of the topics shown in the diagram depends on the preceding one as a precondition and in turn serves as a precondition for the following one.

To meet the requirements of the new curriculum, a series of teaching materials has been developed. These include textbooks and work books, the titles of which are identical with the chemical disciplines concerned. A number of visual teaching aids — mainly transparencies for overhead projections — have also been prepared.

A chemistry student, who passes the basic course,



A schematic diagram showing the structure of the basic course.

receives the same theoretical and practical education as a chemistry student in any other chemistry department in the country. These integrated core studies provide the mathematical, natural, social, scientific and chemical basis for following advanced studies in one of the four branches mentioned above. The advanced studies can be pursued at the same or another university. The knowledge and abilities acquired during the basic studies have to match the most recent scientific standards and should be so comprehensive that the graduate will be able to cope with scientific, technological, economic and political developments throughout his/her professional career.

The advanced courses

During the advanced courses the basic knowledge of the students is enlarged and intensified. Further subjects are added, some being studied by all students of the chosen advanced course, others being designed for deeper specialization, according to the specific research profile of the chemistry department. Chemistry departments differ in the number of advanced courses offered.

In the third and fourth academic year students of different branches must still study common subjects such as industrial chemistry, socialist enterprise management, industrial safety and safety technology, social sciences, history of chemistry and sports. The following are typical topics incuded in the advanced courses:

- *process chemistry*: extended industrial chemistry, chemical engineering, applied physical chemistry,

In the fourth teaching year all students have to do a 12-week practical course in chemical industry.

process analytical chemistry and applied mathematics

- *synthetic chemistry*: inorganic and organic chemical synthesis, concentration and structure analysis and reaction theory
- *theoretical and physical chemistry*: thermodynamics, kinetics, quantum and structure chemistry, physicochemical measurements and advanced mathematics
- *food chemistry*: food chemsistry, technology of foods, microbiology, biochemistry, toxicology and hygiene.

Science has been developing rapidly since the introduction of the new chemsitry curriculum. This demands a continuous change of the syllabus without introducing new disciplines. Unfortunately this is impossible. We have therefore tried to solve this problem by incorporating the subjects which have become essential to chemists over the last decade into the existing teaching programme. These new subjects include information science, environmental protection, biochemistry, biotechnology, toxicology and so on. We now believe that the possibilities of integration have reached their limits and so we are currently looking for other solutions to be implemented in the early 1990s.

In the fourth teaching year all students have to do a 12-week practical course in one of our chemistry plants. This industrial training is jointly planned, carried out and evaluated by the teachers of industrial chemistry at the universities and the chemists employed in industry. The students' achievements in this course are taken into account in the final (main) examination on industrial chemistry.

Traditionally, "Colloquia on the Practical Course" are organized every year. In these, the best results from all chemistry departments of our country are presented. Close cooperation in research and teaching between departments of chemistry and chemical industry provides a good basis for this type of technologically orientated chemical training.

The orientation of the students for their future careers is one of the important aims of our chemistry curriculum. Chemical industry is able to provide students with the mental equipment necessary for the profession. This includes technological and economic comprehension and competence and, above all, the ability for interdisciplinary thinking and cooperation.

A second feature of the present chemistry curriculum is to guarantee a reasonable relation between lectures and seminars on the one hand and laboratory work on the other. The classical German university course in chemistry was characterized by a small number of lectures and lots of experimental work. However, by the beginning of the 1970s theoretical teaching considerably exceeded practical work. We now believe we have found the right balance. For example, the chemistry taught in the basic course accounts for a total of about 500 hours of lectures and seminars and 900 hours of laboratory work.

Independent creative work

The most important aim of putting the chemistry curriculum into practice is to increase the independent creative work of the students. In connection with the new organizaton of the tertiary level education in the GDR, introduced in 1982, the present curriculum offers many opportunities for fulfilling this aim. It is nearly impossible to develop a hierarchical system for all the measures and means available. They overlap, interact with or depend on each other. There are no sharp borderlines between the activities and measures described below. For these reasons the order of treatment should not be regarded as a rank order.

At first sight it seems that a plan with such a large number of compulsory teaching subjects has no room for independent creative activities by the students. But let us consider the advanced courses. The 12-week industrial training course and the one-year spent on the diploma thesis are periods which require the student to be highly independent. These two periods cover more than half the time spent on advanced studies.

Furthermore, we have to add 250 to 350 hours (depending on the topic of specialization) for that part of the advanced course devoted to optional subjects. This is in addition to the 135 to 225 hours of laboratory work for these subjects. But this is not all. For the whole period of study, including the basic course, most semesters (half of an academic year) consist of 15 weeks of compulsory or optional lectures, seminars,

Independent creative work is encouraged throughout the curriculum.

exercises and practical work followed by periods of three to five weeks, which are free for students to solve small independent scientific, practical or theoretical tasks. This pattern is not followed in the fifth year, of course.

Out of a total of 215 weeks of study in chemistry (43 weeks per year), 80 to 90 weeks are devoted to independent work by the students, 110 to 120 weeks to "normal" course work and about 15 weeks to examinations. The exact figures depend on local facilities and differ a little between chemistry departments.

What do students do in these periods which are free from compulsory lectures? In the final year, they are obviously fully involved in research work and writing their diploma thesis. They must also investigate some industrial problems during the 12-week practical course in a chemical enterprise. But how is the rest of the free time used? There is no universal recipe. A broad variety of tasks are tackled by the students. These depend on the chemistry department, the special topic of the advanced course and last but not least on the age of the students, their knowledge, abilities and skills.

Over the past few years the extent as well as the level of independent students' work have increased. Much effort is devoted to introducing students to independent scientific work as early as possible — in some cases in the first course. This covers literature work, experimental tasks with features simulating research, small compact practical courses providing specially selected methods not usually taught in the normal course, cooperation within "Youth Projects" (see below), preparation for performance contests and exhibitions, realization of individual syllabi and the immediate involvement in research activities of the academic staff. These periods devoted to independent work are also used for preparing for examinations and can be used when appropriate by students to catch up with their studies.

Students are encouraged to present the results of independent work in various ways. Some present their papers in poster sessions and students' conferences in their own or in another chemistry department. The best of these are presented to the "Young Innovators' Exhibitions" or to the biennial national "Conferences of Students and Young Scientists" at which the "Schlorlemmer Prize" is awarded by the Ministry of Higher and Technical Education. Some students also participate in international contests in specialized fields of chemistry. In this way students learn to justify the results of their independent work and to stand their ground in scientific discussions.

Students' contest

All the above activities are parts of the "students' contest" in which the majority of students participate and which forms an integrated part of the university course. It is pursued with enthusiastic interest by the best students. This is encouraged by the cooperation of students in publications, lectures and patents and increasingly in scientific instrument manufacture.

The students' contest does not only cover the lecture-free periods but all phases of the curriculum such as laboratory work in the first course, where the contests "who is the best analyst?" and "who grows the most beautiful crystal?" are run. Nevertheless the lecture-free-periods and even the students' spare time are the most effective phases for solving interesting problems independently.

Besides the integration of bright students in the research teams of the department, the participation in "Youth Projects within the Scope of Science and Technology Plan" is the most developed form of students' contest. This movement has been improving quantitatively and qualitatively over the last two years. It involves students of different courses and different disciplines and even young scientists and skilled workers from chemical plants. Moreover, the youth projects are a good way of encouraging interdisciplinary cooperation with fellow students of other fields of study. This is an essential aim of our chemistry curriculum.

Let us now consider another aspect of chemical education at the universities in the GDR. The level of the curriculum corresponds to the abilities of those students who are a little above the average. The relationship between standardization and flexibility may be regarded as well balanced and the widely uniform planning of chemical education at our universities over the past decade has resulted in real progress. However, keeping strictly to a syllabus can retard the progress of specially gifted students. Early recognition of such students is essential if they are to be promoted efficiently. Once recognized they can be helped by

- use of individual syllabi,
- bringing them together and placing them with top scientists,
- special studies at another university in the GDR or abroad or at the Academy of Sciences.

It is the task of academic staff to identify students worth promoting as early as possible. For this reason, close contact between university teachers and students is organized from the outset. Each group of 15 to 20 students has a mentor (tutor) who is a professor or a lecturer. The mentor accompanies the group from the first to the last day of the basic course. Mentors and students meet more or less regularly to discuss scientific, political and personal problems. The students thus get acquainted with their mentor's field of research and in many cases the best of them join their mentor's research team sooner or later.

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Global change and nuclear war

The 21st ICSU General Assembly, held in Berne, Switzerland, 14–19 September 1986, decided to launch an International Geosphere–Biosphere Programme: a Study of Global Change. An open symposium on the Environmental Consequences of Nuclear War (ENUWAR) was also held during the Assembly.

▲ Panoramic view of Berne.

University of Berne. ▶

The President of the International Council of Scientific Unions (ICSU), Nobel Prize Winner (Chemistry 1962) Sir John Kendrew, opened the 21st General Assembly of ICSU at the University of Berne on the evening of 14 September 1986. Sir John expressed gratitude on behalf of the Council to the Swiss Academy of Sciences and the Swiss National Science Foundation for their kind invitation to host this Assembly, the first held in Switzerland since the creation of ICSU in 1931. He noted specifically the high level of attendance of scientists from developing countries from all regions of the world, some of which was thanks to financial support offered by ICSU and the Swiss Academy of Sciences.

Sir John also informed participants that in addition to reviewing the wide variety of ICSU activities undertaken since the last Assembly held in 1984, the General Assembly also provided a unique occasion to explore in depth some of the scientific areas covered by the wide ICSU network. In this context there were two half-day symposia and two shorter lectures, organized during the week. These were open to the general public.

The first such scientific lecture was given by Dr Richard West of the International Astronomical Union (IAU) on the topic of "International Cooperation in Space Research: Comet Halley and After".

The second event took the form of a Symposium on "Consequences of Nuclear War". This Symposium formally concluded a long study undertaken by ICSU's Scientific Committee on Problems of the Environment (SCOPE) on the Environmental Consequences of Nuclear War.

The second half-day Symposium on "Global Change" presented to ICSU and to the scientific community the findings of a two-year planning process on the need for, and appropriateness of, launching an international interdisciplinary programme to illuminate the complex interactions between the biological, chem-

Prof. André Aeschlimann, President of the Swiss Academy of Sciences, welcomes participants.

ICSU President Sir John Kendrew (left) confers with ICSU's Executive Secretary Dr Mike Baker.

ical and physical processes that take place in the biosphere–geosphere system and which result in change.

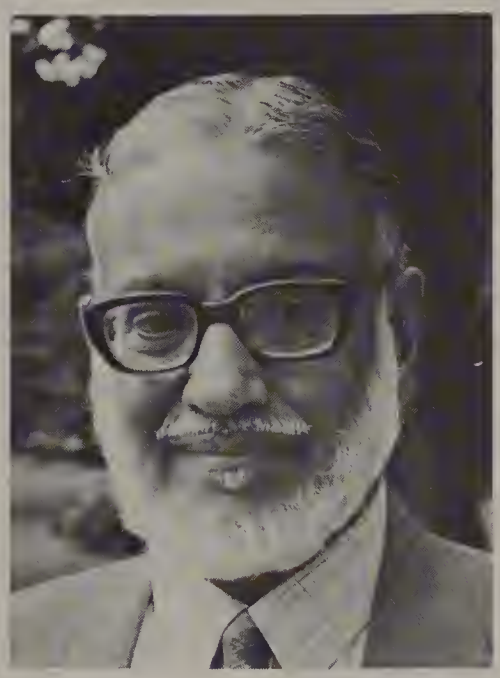
The final scientific lecture of the Assembly was given by Prof. Godfried Schatz of the Biocenter, University of Basel, on "Cell Biology: Today and Tomorrow".

In addition to these special and purely scientific events, the week-long Assembly also saw further discussion of ICSU's activities related to developing countries; of the follow-up to the 1985 Ringberg Conference which examined ICSU's present and future role in international scientific cooperation; and of the activities of ICSU's 20 member International Scientific Unions including IUPAC, its 20 plus interdisciplinary Scientific Committees and the ICSU Press. Reports were also heard from the representatives of a number of organizations of the UN system and from non-governmental bodies with which ICSU has close contacts.

The General Assembly decided to create a Scientific Committee on Biotechnology, one task of which will be to coordinate ICSU's diverse activities in this field and to take up contacts with industrial groups that are active in this area. Even before it was created the Committee had received requests for advice from scientific academies in Latin America.

The Assembly also received a report on toxic waste disposal which drew attention to the importance of the study of old dump sites so as to provide information that will help us to improve our techniques for isolating toxic wastes from the environment.

Prof. M. G. K. Menon, a distinguish Indian physicist, was elected President-elect at the Assembly. Lars Ernster, biochemist from Stockholm, and Klaus Thurau, physiologist from Munich, were re-elected as Secretary General and Treasurer respectively. The six newly elected members of ICSU's General Committee are: J.-P. Schaer, R. Caldeyro Barcia, E. U. Emovon, M. Ito, I. Lang and Bl. Sendov.



ICSU's President elect, Prof. M. G. K. Menon.

Global Change programme

At its 20th General Assembly in Ottawa in September 1984, ICSU organized a multidisciplinary symposium on Global Change as a first step in a two-year systematic study of the need for and appropriateness of launching an international interdisciplinary programme to illuminate the complex and synergistic biological, chemical and physical processes in the Sun–Earth system that determine its changes.

A group of scientists examined the possibilities of launching studies to build on our understanding of the processes that govern the behaviour of the oceans, atmosphere, lithosphere, biosphere and the solar terrestrial domain. Five working groups on: Changes in the Solid Earth; Changes in Terrestrial Ecosystems; Solar–Terrestrial Relationships and Changes in the Upper Atmosphere and Near-Earth Space; and Remote Sensing in Studies of Global Change prepared parts of a possible programme.

Following the Symposium on Global Change at Berne, the General Assembly decided to launch an International Geosphere–Biosphere Programme (IGBP): a Study of Global Change. This will probably continue through to the end of this Century and will include a wide range of studies of the environment of our planet and the changes, both natural and man-made, that are taking place.

The programme will provide the information we need to assess the future of the Earth over the next 100 years. It will be a programme of basic research with almost immediate practical applications in the management of resources at both the national and international levels. It will also provide a means of improving the reliability of forecasts about global changes that might lead to the kind of deterioration in the Earth's environment that would make it less suitable for human and other life.

This programme will interact closely with other major international programmes such as the joint ICSU–World Meteorological Organization's (WMO) World Climate Research Programme and the Man and Biosphere Programme of UNESCO. Although the world community of scientists has in the last 30 years successfully completed a wide range of international programmes such as the International Geophysical Year, the International Biological Programme, The International Hydrological Programme, the Inter-

Prof. Thomas Rosswall, Executive Director of IGBP. The IGBP office will be located at the Royal Swedish Academy of Sciences in Stockholm.

national Lithosphere Programme and the Global Atmospheric Research Programme, these have tended to concentrate on isolated components of the whole Earth system: the atmosphere, the biosphere, the hydrosphere, the lithosphere. The progress made in these areas plus technological advances in high-speed computers and space borne sensors allow, for the first time, a synthesis of information on a global scale, and the development of interactive models.

The programme will be tightly focused, with emphasis on interactive processes that are not addressed by other existing programmes. Topics suggested for early emphasis in the IGBP include:

1. studies of biogeochemical cycles;
2. studies of the ocean euphotic zone;
3. studies of soil dynamics and soil chemistry; and
4. studies of variable solar inputs to the Earth.

Emphasis is also put on the need for development of an adequate global data and information system, that must be an integral part of the programme.

It was recommended that ICSU create a Scientific Committee for the IGBP (SCGB) with responsibility for initiating a preparatory phase lasting about four years and for implementation of an operational phase beginning in the early 1990s. The operational phase will last at least 10 years.

Environmental Consequences of Nuclear War

During the Assembly an open Symposium on the Environmental Consequences of Nuclear War (ENUWAR) was held to present the findings of a study carried out by ICSU's Scientific Committee on Problems of the Environment (see *CI*, Vol. 8, No. 6, pp. 25–26, 1986).

". . . it is not likely that man will ever recover from this calamity."

Nuclear war would lead to disastrous consequences for man and his environment even if the warring factions were not to fire all the atom bombs they store in their arsenals. But the firing of a large number of nuclear warheads would have a lasting effect on our climate, quite apart from the damage through nuclear radiation and direct destruction. As a result our food production would be seriously prejudiced on a worldwide scale.

Long-drawn-out periods of misery and starvation

Scientists from the east as well as the west appear to agree on the whole as to the consequences of nuclear war. At the Berne Symposium calculations were run through in detail. In brief, the results of past research show that:

- Most of those who survive a nuclear war are doomed to die of starvation. The same goes for the inhabitants of countries that are located nowhere near the theatre of war.
- Climatic deterioration brought about by an atomic conflict will be worldwide.
- A total collapse of ecological, economic and social structures is likely to occur, and it is not likely that man will ever recover from this calamity.

Smoke, soot and dust

For many years after the destruction of Hiroshima and Nagasaki in August 1945 scientists tended to concentrate on the study of the direct effects of nuclear explosions: destruction through heat and shock waves; biological damage through radioactive contamination. The indirect long-term effects of a massive nuclear strike began to be investigated only fairly recently.

Quite generally it is assumed that: the exchange of nuclear strikes will occur in the northern hemisphere (Europe, Asia, the USA); the targets will be military and industrial installations as well as big cities; the explosions will cause extensive fires and one fourth of all combustible matter will go up in flames.

Sir Frederick Warner, Chairman, Steering Committee, SCOPE–ENUWAR Study.

Physico-chemical calculations show that these fires might generate as many as 50 million to 150 million tons of smoke and soot. Particles of soot and smoke will get mixed up with dust generated by the explosions, and subsequently the fire storms will shoot them all skyward to distances of 15 kilometres from the Earth. Some days later one third to one half of these particles will make their way back to Earth together with radioactive rain, while the remainder will be carried by the winds over vast regions, forming a dark layer of clouds.

Darkness and low temperatures

In particular, the particles of soot generated by forest and fuel fires resist penetration by the sun. Thirty million tons of soot in the atmosphere of the latitudes of the northern hemisphere would cause a 90% drop in solar radiation on the ground: darkness and low temperatures would be the lot of the survivors. The fall in temperature would be most noticeable in the summer months: the temperature would rapidly drop by from 20 to 40 degrees. Even before the scientists were able to quote accurate figures, they were aware of the fact that these falls in temperature would occur and called this phenomenon "nuclear winter". This nuclear winter might last several months or even years, as minute particles of soot are able to survive in the upper strata of the atmosphere over long periods.

One or two weeks after the nuclear strike the countries located in the southern hemisphere (in Africa, South America and Australia) would also begin to experience climatic alterations. Smoke, soot and dust would now have moved south, covering the sky. However, the darkness would be less pronounced, and the fall in temperature would hardly amount to more than from 15 to 20 degrees. Nevertheless this will cause serious damage to the tropical and subtropical vegetation.

Agriculture in ruins, empty larders

Our survival depends on the existence of a sound vegetation: neither animals nor humans will have anything to eat unless something grows. no agriculture can survive under conditions of a nuclear winter. The experts pointed out that the production of food would be at a standstill for at least one year in the greater part of the northern and many regions of the southern hemisphere. All available supplies would be consumed long before anything could grow again, and no help would be forthcoming. If there should be reserves of food somewhere, which does not seem to be very likely, the ways and means to transport and distribute the goods would still be lacking: there will be no supply of energy or of fuel, our system of communications will have collapsed, together with our economic and social structure.

". . . the majority of those who survive would be condemned to die from starvation."

The scientists from west and east, who have thoroughly studied the consequences of nuclear war on our environment, have unanimously drawn the conclusion that the majority of those who survive would be condemned to die from starvation.

Further damaging effects of nuclear war on our environment

Apart from the nuclear winter and its disastrous effects on agriculture and food production, atomic war would cause further damage to our environment:

- The ozone in the atmosphere would be partially destroyed; ozone is our protective shield against the ultraviolet rays of the sun;
- Toxic substances will be set free, and in industrial areas that have been bombed, chemical reactions will unleash further poisonous matter;
- Generalized radioactive contamination of the air and the water; starving, freezing and possibly sick people would have to face these hazards without being able to obtain medical assistance.

Conclusions

The Assembly decided to disseminate the findings of the study to a wide audience, including decision-makers, the general public and scientists, to increase awareness of the catastrophic effects on humanity of a nuclear war. It drew particular attention to the following conclusions of the ENUWAR Study:

"1. Multiple nuclear detonations would result in considerable direct physical effects from blast, thermal radiation, and local fallout. The latter would be particularly important if substantial numbers of surface bursts were to occur since the lethal levels of radiation from local fallout would extend hundreds of kilometres downwind of detonations.
2. There is substantial reason to believe that a nuclear war could lead to large-scale climatic perturbations involving drastic reductions in light levels and temperatures over large regions within days and changes in precipitation patterns for periods of days, weeks, months or longer. Episodes of short-term, sharply depressed temperatures could also produce serious impacts — particularly if they occur during critical periods within the growing season. There is no reason to assert confidently that there would be no effects of this character and, despite uncertainties in our understanding, it would be a grave error to ignore these potential environmental effects. Any consideration of a post-nuclear war world would have to consider the consequences of the totality of physical effects. The biological effects then follow.
3. The systems that currently support the vast majority of humans on Earth (specifically agricultural production and distribution systems) are exceedingly vulnerable to the types of perturba-

tions associated with climatic effects and societal disruptions. Should these systems be disrupted on regional or global scale, large numbers of human fatalities associated with insufficient food supplies would be inevitable. Damage to the food distribution and agricultural infrastructure alone (i.e. without any climatic perturbations) would put a large portion of the Earth's population in jeopardy of a drastic reduction in food availability.

4. Other indirect effects from nuclear war could individually and in combination be serious. These include disruptions of communications, power distribution, and societal systems on an unprecedented scale. In addition, potential physical effects include reduction in stratospheric ozone and, after any smoke had cleared, associated enhancement of ultraviolet radiation; significant global-scale radioactive fallout; and localized areas of toxic levels of air and water pollution.
5. Therefore, the indirect effects on populations of a large-scale nuclear war, particularly the climatic effects caused by smoke, could be potentially more consequential globally than the direct effects, and the risks of unprecedented consequences are great for combatant and non-combatant countries alike.

In arriving at these conclusions, we have been moderate in several respects. We have tried to state and examine all challenges to theories about environmental effects of nuclear war, to minimize speculative positions and to factor valid criticisms into discussions and conclusions. Uncertainties in the projections could either reduce or enhance the estimated effects in specific cases. Nevertheless, as representatives of the world scientific community drawn together in this study, we conclude that many of the serious global environmental effects are sufficiently probable to require widespread concern. **Because of the possibility of a tragedy of an unprecedented dimension, any disposition to minimize or ignore the widespread environmental effects of a nuclear war would be a fundamental disservice to the future of global civilization.**"

What is ICSU?

The International Council of Scientific Unions (ICSU) is an international non-governmental scientific organization composed of 20 international Scientific Unions, 71 National Members, Associates and Observers and 21 Scientific Associates. Since its creation in 1931, ICSU has adopted a policy of non-discrimination, affirming the rights of all scientists throughout the world — without regard to race, religion, political philosophy, ethnic origin, citizenship, sex or language — to join in international scientific activities.

The Council's principal objective is to encourage international scientific activity for the benefit of mankind. It does this in a number of ways.

1. By initiating, designing and coordinating international interdisciplinary research programmes, such as the International Biological Programme (1964–74), the Upper Mantle Project (1961–70) and that for a study of the interactions between various parts of the biosphere and geosphere, known as the Global Change programme, launched at the 21st General Assembly.
2. ICSU acts as a focus for the exchange of ideas, the communication of scientific information and the development of scientific standards, nomenclature, units, etc. and in the comparison of methods and intercalibration of instruments.
3. Scientific conferences, congresses, symposia, summer schools, and meetings of experts, as well as general assemblies, are organized by various members of the ICSU family in many parts of the world, as well as other meetings to decide policies and programmes. In 1985 more than 500 such meetings were organized.
4. A wide range of publications is produced, including newsletters, handbooks, proceedings of meetings, congresses and symposia, professional scientific journals, data, standards, etc. Some of these are published by the ICSU Press.

For programmes in multi- or transdisciplinary fields which are not completely under the aegis of one of the Scientific Unions such as Antarctic, Oceanic, Space and Water Research, Problems of the Environment, Genetic Experimentation, Solar–Terrestrial Physics and Toxic Waste Disposal, ICSU creates Scientific Committees or Commissions. Activities in areas common to all the Unions, such as Teaching of Science, Data and Science and Technology in Developing Countries, are also coordinated by Committees.

ICSU maintains close relations and works in cooperation with a number of international governmental and non-governmental organizations, and in particular with UNESCO (with which ICSU has taken the initiative in launching a number of international programmes, such as the International Indian Ocean expedition, the World Science and Technology Information System (UNISIST), the international Geological Correlation Programme, the International Biosciences Networks, etc.) and with WMO (with which ICSU has taken the initiative in launching the Global Atmospheric Research Programme (GARP) and the World Climate Research Programme (WCRP)).

IUPAC's Secretary General Prof. Tom West and Academician Sendov sign a Memorandum of Agreement to implement the Affiliate Membership Scheme in Bulgaria.

Three IUPAC Presidents at the ICSU General Assembly: (from left) Prof. G. Smets (Belgium), President, 1977–79; Prof. C. N. R. Rao (India), President, 1985–87; and Prof. H. Zollinger (Switzerland), President, 1979–81.

Affiliate Affairs Secretary Dr Michael Freemantle (left) welcomes new Affiliate Dr Dismas Otieno who becomes the National Affiliate Membership Secretary in Kenya. Dr Otieno represented COSTED (East Africa) at the General Assembly. COSTED is the ICSU Committee on Science and Technology in Developing Countries.

Nobel Laureate Prof. Jerome Karle representing the International Union of Crystallography (IUCr) in Berne. Prof. Karle was President of IUCr from 1981 to 1984. Karle, who is Chief Scientist of the Laboratory of Structure of Matter at the Naval Research Laboratory in Washington, USA shared the 1985 Nobel Prize for Chemistry with Prof. Herbert Hauptman for developing foundation mathematics for crystal structure analysis.

Free Circulation of Scientists

The Assembly also noted with approbation the work of the Committee on the Free Circulation of Scientists that helps scientists from all countries who have problems in obtaining visas. It was also decided to study the application and interpretation of ICSU's policy of non-discrimination which affirms the rights of scientists through out the world to adhere to, or to associate with international scientific activity without regard to race, religion, political philosophy, ethnic origin, citizenship, language or sex.

". . . bona fide scientists should not be excluded from participating in international scientific meetings because of their . . . race, religion, political philosophy, ethnic origin, citizenship, language or sex."

Guidelines on the Free Circulation of Scientists are set out in a brochure ("the Blue Book" entitled *Advice to Organizations of International Scientific Meetings* (ICSU, 1985/86) from which the following passages are quoted:

> "ICSU has been careful to pursue a policy of universality and to avoid the problems of its immediate predecessor, the International Research Council, which from its formation in 1919 had exeluded certain nations from membership. ICSU is a non-political organization . . ."
>
> "In order to assist to find solutions of various specific problems concerning the free passage of scientists and free collaboration among scientists . . . ICSU recommended the creation of a Standing Committee. The current Chairman of the Committee is Prof. I. Fischer-Hjalmars and the Executive Secretary is Dr O. G. Tandberg. The Committee has played an important role in assisting in the resolution of many problems of free circulation since its creation in 1963.

The following paragraphs provide advice to the organizers of meetings on a number of measures which will help to avoid difficulties, and the action to take when confronted by visa refusals.

1. The organizers of meetings should always keep in mind that bona fide scientists should not be excluded from participating in international scientific meetings because of "race, religion, political philosophy, ethnic origin, citizenship, language or sex."

   Prior to the acceptance of an invitation to hold a meeting in a country the local organizers should produce in writing, preferably at the parliamentary level, an indication that no obstacles will be put to the granting of visas to bona fide scientists who wish to participate. The local organizers should also supply information concerning the mechanisms for applications for visas and an indication of the period normally required between application for and receipt of a visa. Even with written assurances from the local organizers in hand, prior to accepting the invitation the international sponsoring organization should seek information from either the ICSU Secretariat or the Standing Committee on Free Circulation concerning the past record with regard to delivery of visas of the country concerned.

Prof. Inga Fischer-Hjalmars, Chairman of the Committee on the Free Circulation of Scientists.

2. The general information announcement of the meeting should include a statement as to the procedures to be followed to obtain issuance of a visa.
3. If visas are not available four weeks before the commencement of the meeting and the proper authorities are unable to indicate when the visa will be available the appropriate national body or — failing this — the participant should write to the designated Union Officer who, in turn, should notify the host committee chairman and the Chairman and Executive Secretary of the ICSU Committee on Free Circulation of Scientists, with copies to the ICSU Secretariat in Paris. It is particularly important that the participant should provide suffieient information concerning the steps taken to illustrate that he has followed the eorrect procedure.
4. In the first instance action will be taken by the designated Union Offieer. If necessary action will then be taken by the Chairman of the Standing Committee on Free Circulation and, where necessary, by the Offieers of ICSU in an attempt to resolve the problem.
5. If the actions taken under (4) are unsuccessful the international sponsoring organization will be informed.
6. The international sponsoring organization should provide the Chairman of the Standing Committee on Free Circulation of Scientists with the following information concerning visa refusals:

   (a) date of invitation, including any statements

concerning the delivery of visas,
(b) date of first indications that visas would not be available,
(c) bona fides of scientists concerned,
(d) action taken,
(e) effect of actions, including dates of refusal and authorities,
(f) reactions of local organizations responsible for invitation,
(g) follow-up action to local authorities.

It must be stressed that time is needed for effective discussions concerning visa problems.

7. As a consequence of refusals most of the following means of registering disapproval have been used:

(a) publicizing information concerning the refusal to grant visas,
(b) issuance of a formal protest statement at the commencement of the meeting,
(c) withdrawal of international sponsorship,
(d) possible cancellation of the meeting or removal to another site,
(e) issuance of a statement that decisions of the meeting cannot be considered valid until all voting delegations, including those not allowed to be present, have the opportunity to exercise their voting right,
(f) independent decision on the part of some scientists to absent themselves voluntarily,
(g) recommendations to all ICSU bodies not to accept invitations to hold meetings in the country until the situation is remedied.

Comet chemistry

A new age was born in 1957 when the first artificial satellite was launched into orbit around the Earth. Since then, space-based activities have had an irreversible influence on our daily lives. Space research is now actively pursued in about 40 countries although only a few of these have their own launching capacities.

The enormous complexity and the large cost of advanced space programmes, combined with the political will to cooperate, have led to an increasing number of projects with international participation. The first phase of reconnaissance around the Earth, moon, sun and other major bodies in the solar system, is now coming to an end. The next generation spacecraft will be even more versatile and complex, and there will continue to be need for close international cooperation.

The recent ground- and space-based activities in connection with the 1985–86 passage of the famous Comet Halley, provide an example of very successful multilateral collaboration. The establishment of an Interagency Consultative Group with participation from Europe, Japan, USA and USSR, ensured a smooth coordination of the space effort. On the ground, the International Halley Watch coordinated observations made by well over 1000 scientists and supported the space projects with vital data.

The positive experience gained with the Halley campaign has led to plans for continued, close contacts on all levels. Several major space projects with international participation are in the planning stage, some of which may become connected with the ICSU Geosphere–Biosphere Programme. The suggestion of an International Space Year in 1992, on the occasion of the 500th anniversary of Columbus' voyage, has been well received and would further contribute to the internationalization of space research.

In his lecture at the ICSU General Assembly entitled "International Cooperation in Space Research: Comet Halley and After" Dr Richard West, Head of the European Southern Observatories Information Service, said that in order to fully appreciate the importance of the observations of Comet Halley, we must begin a long way back. One of the most fascinating subjects of modern astrophysical research is the study of the evolution of stars. These enormous bodies, of which the nearest is our sun, do not exist eternally, they are born and they die. Star births take place in dense, interstellar clouds of gas and dust — in our galaxy, the Milky Way, there are many such areas in which stars are being born right now.

The sun and its planets were conceived in such a cloud, about 4700 million years ago. We do not know how this happened, but it is quite possible that a sudden compression of the parent cloud took place as a result of the violent explosion of a nearby, old star. A dying star thus may have given life to a new one. Once the cloud had begun to contract, it soon became very compact at the centre and when the temperature and pressure were high enough, nuclear processes started. After a while, the outward pressure generated by the fusion process was able to support the weight of the material above and a state of equilibrium was reached. The sun had been born.

Some of the remaining material around the young sun was used to build the major planets, but most of it was blown away into surrounding space. The heavy elements migrated in the direction of the sun; this is why the mean density of the four inner planets is much higher than that of the outer, giant planets. Far out, near the fringes of the solar system, light, icy material was left over, part of which has survived to our days in some of the moons of the outer planets, and in particular, in the comets. The comet nuclei are small

Dr Richard West: Comet Halley and After.

Helium erupting from the Sun. When a comet comes close to the Sun, the ices in the nucleus start to evaporate (*Photo courtesy NASA.*)

objects, some kilometres across, consisting mainly of water and carbon dioxide ices, mixed with dust particles. It is believed that perhaps 10^{12} comets move slowly in enormous orbits within the confines of the so-called Oort cloud, a gigantic cloud that surrounds the solar system at a great distance, about 50 000 times farther away from the sun than the Earth. Once in a while a comet is deviated, perhaps by the gravitational pull of a passing star as the solar system moves through the Milky Way. If the comet thereafter comes close to one of the outer planets, it may end up in a short-period, small elliptical orbit, which brings it near the sun and the Earth at regular intervals.

It is only then that the comet can be discovered and observed. When it is close to the sun, the ices in the nucleus start to evaporate and soon form a gaseous, dusty envelope which can be seen in reflected sunlight. Long tails form, as the gas and the dust particles are pushed away by the solar wind.

Until 1986, about 750 comets had been accurately observed, and the most famous of them all is Comet Halley, which has a 76-year period. The reason for our special interest in Halley is now obvious; it carries a pristine sample of the material from which the solar system was born.

West later went on to add that the most exciting experiments, at least in the public opinion, were of course the imaging ones. The Vega pictures and those of higher resolution from Giotto, reveal that the nucleus is extremely dark, the reflectivity is only 3–4%, making it the darkest body known so far in the solar system.

Halley's nucleus is significantly larger than thought before, it is potato shaped and measures about $8 \times 8 \times 15$ kilometres. The visible surface features include ridges and "craters" which are probably associated with vents from where gas and dust is released on the sunward side. It is likely that a large part of the interior consists of water ice, since water vapour is by far the most abundant gas near the nucleus. The dust grains contain much carbon, oxygen, nitrogen and hydrogen but also heavier elements like silicon and iron. There are speculations in some quarters that the dark crust may consist of non-volatile organic substances. The nucleus was seen to lose about 15 tons of gas and 3 tons of dust per second, giving it an estimated remaining lifetime of 250 000 years. There were many more, very small and light dust grains than anticipated. The region around the nucleus which is undisturbed by the solar wind was encountered by Giotto at a distance of 4300 km.

From AAG to WWW

The ICSU Year book: 1986 defines nearly 400 acronyms and abbreviations of scientific organizations — including IUPAC. It also contains essential details including names and addresses of all ICSU's National Members, International Scientific Unions, Scientific Committees and Scientific Associates. Finally, the book also contains information about ICSU itself, its publishing house, and its programmes — such as those on Global Change, genetic experimentation, the environment, Antarctic research, waste disposal, education, Third World needs and biotechnology.

The *ICSU Year Book* has been published annually since 1954. The 1986 edition is being made available for the first time outside the ICSU family.

And now to answer the question you've all been asking. AAG is the Association of Arab Geologists and WWW the World Weather Watch.

The book is edited by P. A. Bahmani Fard and F. W. G. Baker and published by ICSU Press, June 1986. ISSN 0074-4387/ISBN 0-930357-08-6. Single copies at US-$ 25.00 post paid are available from ICSU Press, PO Box 016129, Miami, Florida 33103, USA.

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Secretary General's column

The Bureau of the Union, which consists of the Officers, the immediate Past-President, the Presidents of the seven Divisions and 10 Members elected by the Council, met at Oxford, UK, 28–29 September to discuss progress since the 1985 General Assembly in Lyon, France, and to take decisions necessary before the next General Assembly in Boston, USA, 21–29 August 1987.

Critical assessment by Vice-President

President 'Ram' Rao (India) presided over a full meeting with a crowded agenda. However, probably the busiest person of all was Vice-President Valentin Koptyug (USSR), who not only participated fully in the meeting, but spent the previous two days interviewing each of the Division Presidents in turn on the work of their respective Division Committees and every one of their Commissions, having also produced a detailed critique of each Division programme at the Bureau with suggestions for improvement.

Vice-President Valentin Koptyug spent two days interviewing each of the Division Presidents.

This Vice-Presidential review, initiated by Past-President Heini Zollinger, 1979–81, takes place at the Bureau meeting in the year prior to a General Assembly and is invaluable in improving the Union's performance. It would, however, be inappropriate for me to comment here on this year's review. The main points will be made known to the National Adhering Organizations (NAOs) in due course. I have no doubt that individual Division Presidents will already have been in touch with their Commission Chairmen and Secretaries about the outcome of these discussions. Not all the messages received may be comforting.

Bureau elections, August 1987

At Boston the Council, meeting at the end of the General Assembly, will have to elect a new Vice-President/President-Elect who will become President in 1989. Both the Secretary General, T. S. West (UK), and the Treasurer, A. Björkman (Denmark), will have served four years in 1987 and relinquish their office, though each may serve for a second, and final, four-year period if renominated and elected. At the end of 1986, the NAOs of IUPAC were notified of these vacancies and of the five, or more, for elected Members of the Bureau. NAOs are required to have their nominations in the hands of the Secretary General at the Secretariat by 28 June.

New scrutiny procedure for elections

In the past, the Bureau has been responsible at the General Assembly for making nominations for elected Members where an insufficient number has been proposed by the NAOs and for making additional nominations, where it is thought necessary for good reason. In addition the Bureau is required, by Bylaw 2.222, to make recommendations to the Council — which are not binding — for the filling of vacancies where there are more nominations than vacancies. This task is often a difficult one for the Bureau, because of the time factor and a usually crowded Agenda. For this reason the Bureau at Oxford decided to set up a Nomination/Election Committee to function before and report to the next Bureau meeting at Boston and to bring forward proposals for its consideration as necessary.

The N/E Committee will be chaired by President Rao and will include the immediate Past-President, Dr W. G. Schneider (Canada), Vice-President Koptyug, Dr D. R. Lide (USA) as Convenor of the Division Presidents group, Prof. Y. Jeannin (France) as a member of the Executive Committee, together with an elected Member of the Bureau, who is not a candidate for election and who will be nominated subsequently by the President. The formation of this N/E Committee with a draft set of rules does not interfere with the statutory rights of the Bureau with respect to its overall responsibility to the Council for elections.

The Bureau at Oxford also approved a proposal for the nationality of each Division President for 1987–89 to be made known to the Council before the elections for the Bureau, though it was agreed that the Division Presidents serve their Divisional interests entirely without national responsibilities.

General Assemblies, Boston 1987 and Lund 1989

The Bureau noted and approved the arrangements made for the 34th General Assembly at Boston

Verse to be treasured — II

IUPAC Bureau

IUPAC Bureau is in Oxford City
very nice people, some even witty
Our stuff is quite dull
but out of the skull
emerge new ideas to enrich IUPAC's kitty

Anders Björkman
Treasurer

University (21–29 August 1987) by the Deputy Executive Secretary, Ann Troughton and also, in principle, a proposal made by the US National Committee for IUPAC (USNC) that allowance might be made for a limited number of IUPAC Affiliates to attend Commission meetings, provided their applications are vetted by USNC and subsequently approved by the appropriate Commission Chairmen. The Bureau commented that some of the Commissions' business, e.g. matters relating to elections or other non-scientific matters would, at times, preclude the presence of Affiliates.

Looking to the subsequent General Assembly, the Bureau heard of outline proposals for the 35th Assembly in Lund, Sweden (9–18 August 1989), in the Departments of Mathematics and Electrical Engineering of the University of Lund. As in Boston, accommodation will be in student dormitories, but hotels will be available in Lund for those who require them.

IUPAC Congress, Stockholm 1989

The programme and arrangements for the 31st IUPAC Congress in 1987, i.e. the meeting for original scientific papers, in Sofia, Bulgaria (13–18 July), are well in hand and required little discussion at the Bureau. Plans for the programme of the 32nd Congress in Stockholm, Sweden (2–7 August 1989) were presented by Prof. I. Lindqvist (Swedish Natural Research Council and Chairman of the Programme Committee) under six main headings, which were approved by the Bureau:

- Chemical separation analysis
- Signal substances
- Chemistry of the atmosphere and the oceans
- Electron transfer in organic- and bio-chemistry
- Structure and function of natural macromolecules
- Solid state chemistry

Assembly in Athens 1991?

Looking even further ahead, the Bureau noted with pleasure an invitation from IUPAC's Member for Greece, the Association of Greek Chemists, to hold the 36th General Assembly of IUPAC on the campus of the University of Athens. This proposal, together with any others that may be forthcoming, will be discussed by the Council at the 1987 Assembly in Boston. There can be little doubt that the prospect of an Assembly held in the cradle of European science and civilisation will prove very attractive.

It should be noted that there is as yet no invitation to host an IUPAC Congress in 1991.

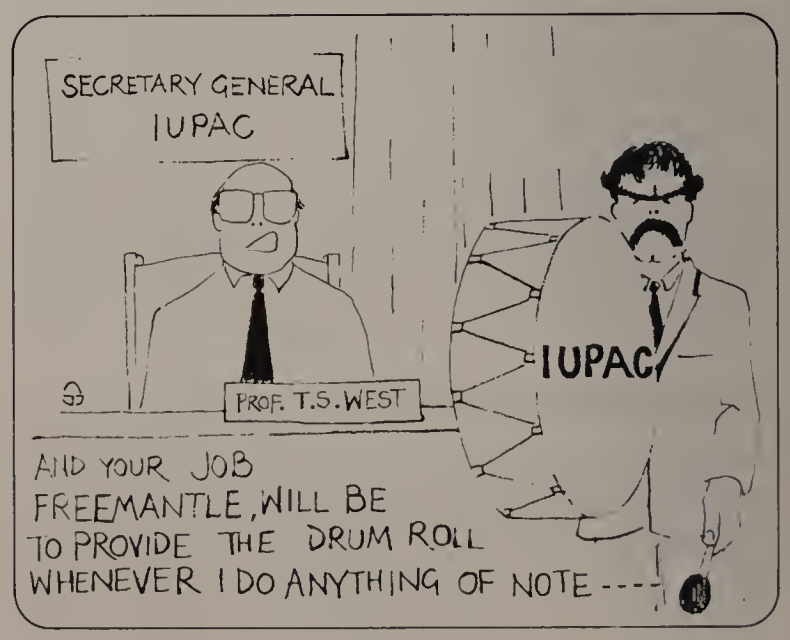
Provisional Section on Medicinal Chemistry: Commission on Biotechnology

The initial plans for a programme for an IUPAC Section on Medicinal Chemistry were outlined to the Bureau by Prof. C. G. Wermuth, Chairman of the Provisional Section Committee. A more fully elaborated scheme will now be prepared and submitted to the Bureau at Boston, when a decision will be required as to whether to proceed with a full Section.

For those readers who wonder what difference there is between a Division and Section, I should perhaps indicate here that a Section usually has a smaller and less formalized infrastructure than a Division. The most recent Section was the Clinical Chemistry Section, which achieved Divisional status in 1979.

The Bureau heard of considerable progress in the re-establishment of the Applied Chemistry Division's Commission on Biotechnology (VI.2) from Division President P. C. Kearney and the Secretary General reported on the International Council of Scientific Unions' (ICSU) plans for an inter-Union Scientific Committee on Biotechnology, in which IUPAC will play an important role with several of the Bio-Unions.

The 1986 ICSU General Assembly, at which the Union was represented by the Secretary General, but which was also attended by President Rao and two former IUPAC Presidents, G. Smets (Belgium, 1979–81) and H. Zollinger (Switzerland, 1977–79), is the subject of a separate report in this issue (see pp. 54–62).



Long-form Periodic Table of Chemical Elements: Criteria for establishment of discovery of transfermium elements

Nomenclature and elections are invariably the centre of intense interest in IUPAC and usually cause a great deal of discussion. Because I have already referred to elections in this column, it is appropriate to mention the intense interest aroused in the Bureau by the IUPAC proposal to reformulate the presentation of the Periodic Table of the Chemical Elements.

Basically the discussion revolved round the short (8-column) form of table and the long (18-column) version which is now widely used in many countries and is indeed reproduced in IUPAC's manual *Nomenclature of Inorganic Chemistry* (The Red Book). Much confusion, however, arises over the numbering of sub-groups (more accurately sub-families) in the long-form table, because different A and B designations are used in USA and in Europe.

The Bureau endorsed the view of the Committee on Nomenclature of Inorganic Chemistry (CNIC) — see pp. 49–50 of this issue of *CI* — that IUPAC should continue to favour the long-form (18-column) Periodic Table in the new edition of the Red Book.

Basically, the CNIC approach seeks to impose no new terminology, nor to forbid the use of the short-form (8-column) table to those who wish to do so. It merely offers a broadly useful solution to a problem where confusing conflicts in nomenclature occur in practice. It should be said that CNIC has studied this particular problem for over 16 years and has itself sought to stimulate open discussion. The form of the Periodic Table is a subject close to the heart of a great many chemists and is capable of arousing intense feelings. However, the Bureau recognized that the CNIC recommendation seeks to maintain the middle ground, and to clarify and simplify rather than to improve new ideas — an ideal which all IUPAC Nomenclature Commissions must surely seek to achieve.

In passing, I should add that Prof. N. N. Greenwood (UK) and Prof. Y. Jeannin (France), both Past-Presidents of the Inorganic Chemistry Division (II), have been appointed as our representatives on inter-union IUPAC/IUPAP Working Group set up by the International Union of Pure and Applied Physics (IUPAP) to establish criteria for decisions on the discovery of the transfermium elements — another hotly disputed international topic.

36 Countries now participate in IUPAC Affiliate Membership Scheme: Others to join in 1987/8

In his report on the new Affiliate Membership Scheme (AMS), which began in several countries in January 1986 and will begin in others in January 1987, the Secretary General reported that the following countries, which include 19 that are not full members of IUPAC, now had between them 5500 Affiliates.

Algeria
Argentina
Brazil
Chile
China
Colombia
Denmark
Ethiopia
FRG
France
Ghana
Hungary
India
Ireland
Jamaica
Japan
Kenya
Malaysia
Mexico
New Zealand
Nigeria
Papua New Guinea
Philippines
Rep. of Korea
Singapore
Solomon Islands
Sri Lanka
Sweden
Switzerland
Tanzania
Thailand
Turkey
UK
Uruguay
USA
Zambia

Several other countries had earlier indicated their intention to begin a Scheme in 1987/8, having been unable to arrange for it to start in 1986. These include Australia, Bulgaria, Canada, Czechoslovakia, Netherlands, Poland, Rep. of South Africa and USSR.

The Secretary General briefly outlined proposals for the formation of an Affiliates Committee within IUPAC, which he would elaborate further with the Executive Committee in due course. The basis was that AMS was now extending the dissemination of information on IUPAC's work directly into the hands of interested chemists outside the Union's Commissions and including, for the first time, many non-IUPAC member countries — particularly less developed countries. These chemists, who had voluntarily supported the Union and revealed their presence, should have some formal mechanism within the committee structure of IUPAC to provide the Union with feedback information on its activities.

It was suggested that an Affiliates Committee, reporting to the Bureau, Executive or Council, could be comprised of representatives of the (permanent) Secretaries of participating Chemical Societies who frequently attended the International Meetings of Chemical Society Presidents. These meetings now tend to take place immediately after or just before the IUPAC Council and at the same location. Secretaries rather than the Presidents of Chemical Societies were suggested because they would be able to give greater continuity and were likely to have greater opportunity to be in touch with their national IUPAC Affiliates.

The Bureau meeting in Oxford.

IUPAC Commissions to consider Affiliates for membership

At their meeting immediately before the Bureau in Oxford, the Division Presidents were reminded that Commissions should be encouraged to give consideration to the election of interested Affiliates to their membership or their working groups (see "Ourisson's Law" below). Commissions were under no compulsion to recruit Affiliates, but their presence and interest had now been recognized and should result in the involvement of some of them in the Union. Division Presidents were informed that lists of Affiliates interested in the activities of the various Commissions would be distributed to Commission Officers before the Assembly in Boston.

". . . Commissions should be encouraged to give consideration to the election of interested Affiliates to their membership or their working groups . . ."

History of IUPAC to be commissioned for 1989

IUPAC was founded in 1919 and has a long and interesting history. Some time ago, the late Prof. Stig Veibel (Denmark) compiled a manuscript on the history of IUPAC from his own long knowledge of the Union and from numerous sources, including minutes of meetings and other documents. The manuscript had been read by the Executive Secretary and Secretary General and others and, whilst judged to be unsuitable for publication as it was presently constituted, it was nevertheless felt to form the basis of a 'History' which could be further developed and updated to produce a worthwhile account to be issued in 1989 to mark IUPAC's 70th year. Mr R. W. Fennell, a former Division Secretary and Editor of *CI* had expressed an interest in editing it.

The Bureau, which recognizes that such a book would have a limited circulation and could at best be expected only to be barely self-financing, nevertheless felt that the matter was sufficiently important and worthwhile to justify publication. The Executive Secretary was authorized to proceed with a view to its preparation.

Structure and working of IUPAC to be reviewed

Although I am aware that there were many other matters discussed by the Bureau which are of importance and interest, I have room here to mention only two more topics. The first arises from a suggestion from USNC that the Union should examine its structure, particularly the functioning of its Commissions and Committees. Outside the Union some people perceive IUPAC to be a static organization, with many self-perpetuating standing Commissions and Committees. The biennial critical assessment by the Vice-President and the A/B budgeting system are seen to be internal moves to free the system of some of its alleged self-perpetuating inertia and the AMS as a means of breaking the charmed circle and introducing new blood — as I have indicated above — but are not thought to be sufficient.

The USNC suggested retention of a form of the divisional structure with limited lifetime, e.g. 2–3 years, working groups set up to address specific questions and then to be disbanded. It was suggested that many more eminent and busy research scientists might be willing to work on such specific tasks of limited duration though they might not be

willing to commit themselves to longer terms of service on Commissions as they are presently constituted. This proposal received a mixed reception, but there was unanimous agreement that it warranted further consideration. An *ad hoc* Committee under the Chairmanship of Past-President Schneider, with D. R. Lide, (Convener of the Division Presidents group), A. A. Vlček representing the Executive Committee, and Secretary General T. S. West, was, therefore, set up to look into the matter and to report back to the Executive Committee in Spring 1987 and to the Bureau at Boston in the Summer.

Divisions to become more involved in teaching of chemistry

The other topic concerns the subject of the teaching of chemistry. During discussion whether the IUPAC Committee on Teaching of Chemistry (CTC) should report to the Council or the Bureau, there emerged a view that all the Divisions had serious concerns on the way that chemistry was taught in secondary and tertiary institutions and also in developing countries. At present the membership of CTC is appointed by the President in consultation with the Executive Committee. It has various links with international organizations, including UNESCO. The Bureau resolved that CTC should, in future, have Associate Members nominated by the Division Presidents in much the same way as the Interdivisional Committee on Nomenclature and Symbols (IDCNS). These Associate Members would receive all CTC papers and represent their Division's views to CTC by correspondence at least until Boston.

Ourisson's Law: A message to all Commissions

Have you heard of Ourisson's Law? In this message to Commissions the Secretary General explains Ourisson's Law and how it has acquired a new principle.

My predecessor as Secretary General, Guy Ourisson, formerly Professor at the Centre de Neurochimie in Université Louis Pasteur, Strasbourg and now Director of the CNRS Institute de Chimie des Substances Naturelles at Gif-sur-Yvette, frequently advised Division Presidents on certain principles that should be observed in appointing new members to Commissions.

In the Bureau, these principles rapidly became known as Ourisson's Law. Since then, all Division Presidents have changed — and indeed most of the Bureau members. It is therefore quite appropriate for me as a long-serving member of the Union to draw attention to it again in view of the General Assembly in August. If I remember it correctly it went something like this:

Commissions should always choose the best international experts for their tasks but, *when two people are otherwise equal* Commissions should choose:

1. **a younger person rather than an older one,**
2. **a person from a developing country rather than a developed country,**
3. **a woman rather than a man.**

In IUPAC we still hold these principles of Ourisson's Law to be true and worthy of observation.

IUPAC is an equal opportunities union!

Times change, however, and so fortunately does IUPAC. The Affiliate Membership Scheme, for example, has started to break IUPAC's 'exclusive club' or 'charmed circle' image amongst the world's chemists. By consent of their NAO's chemists can now become associated with IUPAC as Affiliates thus showing their support of and interest in the work of the Union and revealing their presence as potential recruits for Commissions or working groups. It now behoves those of us who are fortunate enough to be active in IUPAC to remember the Affiliates' presence and take it into account.

Thus, bearing in mind, once more, that Commissions have as always the right to choose the best people for their tasks we now have to add that *wherever two people are otherwise equal* they should bear in mind a new fourth principle, that is Commissions should choose:

an Affiliate rather than a non-Affiliate

We do not, of course, expect that the application of these four principles will result in an exclusive crop of young, female, Affiliates from developing countries on our Commissions, but we do urge Commissions to bear these principles in mind once more at Boston, *including the new fourth principle which comes into operation for the first time.*

To this end, prior to the Boston Assembly all Commission Chairmen have been given a list of Affiliates who have expressed an interest in their specific work. Thus Commissions will have the opportunity to consider appointment of some Affiliates as Associate or Titular Members, members of working groups.

T. S. West

Commission & Committee News

The measurement of oxygen partial pressures

The Commission on High Temperature and Solid State Chemistry has recently successfully completed a worldwide experimental study involving collaboration between ten laboratories and four manufacturers of stabilized zirconia. The principal objective of the project was the evaluation of commercially available materials used to measure oxygen partial pressures.

Tubes specially fabricated from five different types of commercial stabilized zirconia were studied. Three of the materials were stabilized by CaO and two by Y_2O_3. The physical characteristics and microstructures of these materials were investigated in detail and the results reported in full[1]. The tubes were then distributed by the Commission to the collaborating laboratories where they were used as electrolytes in solid-state oxygen sensors.

The operating principle for such gauges in the determination of the emf of an isothermal cell of the type

metallic electronic conductor, p''_{O_2}	stabilized zirconia electrolyte	metallic electronic conductor, p'_{O_2}

The value of an unknown partial pressure, p''_{O_2}, can be determined from the emf, E, of the cell at temperature T from the following equation so long as the value of oxygen partial pressure, p'_{O_2}, is known with sufficient accuracy.

$$E = \frac{R\,T}{n\,F} \ln \left(\frac{p''_{O_2}}{p'_{O_2}} \right)$$

where R is the gas constant, F the Faraday constant, and $n = 4$ (the number of electrons involved).

The fabrication of the gauges, which involved the application and firing of platinum paste electrodes, the arrangements of thermocouples and reference and unknown atmosphere flows, and the measuring circuitry were all examined in detail. The gauges were then subjected to an extensive series of electrochemical tests in each laboratory[2].

The results of these measurements were analysed centrally and the performances of the gauges, when used to measure known pressures of oxygen were critically examined and assessed. Particular attention was paid to possible sources of error.

The study also provided guidelines on the levels of accuracy that can be achieved when gauges are assembled in the manner described in the report.

The performance of the stabilized zirconia was also evaluated when gauges made from it were used in one of the participating laboratories in a second series of tests. These were carried out at very low oxygen partial pressures and were designed to examine the effect of electronic conductance in the electrolytes and to determine a domain of ideal response for the gauges[3].

Electrochemical oxygen monitors based on stabilized zirconia electrolytes are now widely used for measurements in gaseous, liquid and solid phases. They operate well only at temperatures in excess of 900 K and are thus subjected to severe environmental conditions during service.

This collaborative research project has provided extensive data all of which are collected in a comprehensive and general report. The report seeks to highlight the factors, relating to both the fabrication and operation of the gauges, which are critical to their proper functioning. This Commission report, which is the product of a commendable and sustained concerted effort on the part of the manufacturers and of the collaborating laboratories, will provide a useful and detailed source of information for any laboratory which may wish to build such gauges and use them to measure oxygen activities.

R. Metselaar

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Periodic Table proposal reaffirmed

The Commission on Nomenclature of Inorganic Chemistry (II.2) held its annual meeting in Heidelberg, FRG, 16–21 August 1986. The meeting was mainly dedicated to finalizing work on the revised and improved version of *Nomenclature of Inorganic Chemistry* (Red Book). Part I of the Red Book is scheduled to go to the publisher in 1987.

The Commission dealt anew with the format of the Periodic Table which will be part of the Red Book for internal reference purposes. After a lengthy discussion the earlier proposal to number the groups in the long form of the Periodic Table, serially from 1 to 18, was reaffirmed (see p. 49). In addition, the annex of the Red Book will show other formats of the Periodic Table used in the literature such as the short form, the long form with various group designations, and a 32-group form.

E. Fluck

Chemical actinometers

The Commission on Photochemistry met in Lisbon, Portugal, 29 July–1 August 1986 on the occasion of the IUPAC sponsored Symposium on Photochemistry. There was general agreement on the draft on "Fluorescence Standards". It is now almost finalized and only details should be improved. The document will be passed on to the Organic Chemistry Division for approval after the meeting at the Boston General Assembly. It consists of a list of recommended standards for the determination of fluorescence lifetimes and fluorescence quantum yields.

A round table discussion on chemical actinometers was held. It was sponsored by the Commission in order to receive the input of the photochemical community for the recently started project on this subject. A first draft on a critically evaluated list of chemical actinometers for the determination of quantum yields of photochemical reactions was distributed to many photochemists participating in the meeting. Many are experts in the field and are ready to collaborate with the working party.

A series of experiments on photochemistry have now been collected and will be the basis for a document on "Educational Aspects of Photochemistry" to be offered for evaluation to the Commission on Teaching of Chemistry.

The "Glossary of Terms used in Photochemistry" was reviewed on the basis of comments made by members of the staff of Chemical Abstracts and by some members of the IDCNS.

Two other projects, one on "Standardization of Data Analysis of Fluorescence Decay", and another one on "Methods and Standards for the Determination of Molar Absorption Coefficients of Transient Species in Solution" are now under way and names for a working party were suggested for each of them.

Silvia E. Braslavsky

Important physical chemistry of polymers document completed

The Commission on Macromolecular Nomenclature made major progress during the past year and at its meeting in Koblenz, FRG, August last year. It completed work on a key report offering some two hundred definitions of physical–chemical terms dealing with individual macromolecules, their assemblies, and dilute polymer solutions. This document covers a large fraction of fundamental polymer science, and represents one of the most significant achievements in the history of the Commission.

The Commission also completed work on a report describing a new way of classifying polymers by structure. Both of these reports have had the eight-month public exposure, and are now ready for final publication. The Commission finished writing a note dealing with abbreviations in the polymer field. This is now ready for publication.

Two other important documents (one on crystalline polymers, the other on stereochemical terminology) have completed the eight-month period but, because of comments from the scientific community, will require some revision prior to publication. It is hoped that the revisions can be completed, and the documents submitted in final form to IUPAC, before the next meeting of the commission.

Substantial progress was also made on the terminology used for polymers in the bulk state: on a new system that will permit structure-based naming of irregular polymers (head-to-head, reacted polymers, etc), on conventions for writing structural formulas of polymers, on naming of non-linear polymers (branched, star, crosslinked, etc.), and on a compendium of nomenclature documents in the polymer field.

Work has been initiated on a revision of the basic definitions used in polymer science, on structure-based names for ladder polymers, and on terminology applicable to liquid crystals.

N. M. Bikales

Solubility data automation project

The 12th Annual Solubility Data Commission meeting was held in Newark, New Jersey, USA, 19–21 August 1986, just prior to the 2nd Symposium on Solubility Phenomena. Approximately 50 members and observers attended the meeting. The Commission voted on holding a 3rd Symposium on Solubility Phenomena in Surrey, UK, in 1988.

Efforts by the Commission concerning data automation were reviewed. The Commission's ability to produce improved camera-ready data sheets will soon be in place due to the purchase of several high-quality printers located in strategic locations. These sites will receive and produce the camera-ready copy for submission to the publisher. The IUPAC Committee on Chemical Data Bases has approved and partially financed a pilot data inputting project for producing an electronic solubility data base. The work will be carried out at the Solubility Data Center at Emory University with the cooperation of the Center for Research in Computational Thermochemistry in Montreal.

Considerable discussion and planning for charting the future activities of the Commission were carried out. The topics covered included future recruiting efforts, pricing policies, and publicity. The latter two items were discussed rather thoroughly with the representative of Pergamon Press Inc., W. D. Crawley, Vice President for Book Publishing. A number of initiatives in these areas were agreed upon.

New subjects for volumes were approved as was a decision to reprint the "Guidelines" document which would incorporate needed changes. To date 26 volumes have been published in the *Solubility Data Series*.

Lewis H. Gevantman

A Compatibility Programme for Solubility Data Compilation

We gathered in Newark, Commission Five-Eight
Which the Secretariat loves to hate
Hosted by Reg* and the forces of Nijit —
A task so demanding most called him an idiot
But inspired by the memories of London, and Jack
He recruited a team, and never looked back.
Mark was dragged from his home by the sea,
Forsaking the labs of the US Army.
The vans and their drivers dashed here and there,
Collecting all those who had travelled by air.
For such a Symposium all problems are SOLUBLE,
In our Commission, with a Chairman so voluble
That his own University sends him abroad
To United States campuses which can afford
The telephone costs and paperwork mess
Of the Editor-in-Chief of the SDS.

Rubin came too, with one aim in particular:
His tremendous concern with the extracurricular.
By the end of the week we thought it a pity
That the meeting was held so close to the city.
Lew tried hard to plan each day
But Steven always had his say.
All our data we now can carry
On floppy disks to Atlanta Larry —
Or to Forrest, if he can claim
That his format's just the same.
Bernhard studied each new English word
But could not remember all he'd heard
If he does not listen with more attent
It is to Coventry that he'll be sent.
Colin performed at his usual high pressure
Gas–liquid properties that he could measure

George looked in on Tuesday morning
Bringing with him one stern warning:
Although we have written the Solubility Bible
It still has to be — commercially viable.

Allan's news of the Cup was met with mirth
When he came to New York from down under,
in Perth.
At London he offered an alternative plan
Opposed by all except one man
And to his regret it met with failure —
No meeting next year in West Australia.

The program for guests was such a hit
That members themselves attended it
But Thursday's Princeton lab excursion
Somehow met with marked aversion.
Our younger guests weren't forgotten at all
And Helen made new friends in Hall.
The food provided was so abundant
That breakfast soon became redundant.

Angela made plans in frantic hurry
With only two years to the meeting in Surrey
Guildford is the next Symposium slot
But we meet next year to talk a lot
In Boston, with every last commission
To look once more at our position.

So finally when we take our leave
We would ask you to believe
That pleasant memories we all pledge
Of the New Jersey Institute, and Reg.

Allan Barton

**Ed.* — The characters referred to in this poem are listed in the *IUPAC Handbook 1985–1987*. The poem purports to be a 'report' of the Commission V.8 meeting and 2nd International Symposium on Solubility Phenomena held in Newark, New Jersey, USA, 12–15 August 1986. The report was presented at one of the less formal sessions of the symposium (the banquet!).

Provisional Recommendations

IUPAC seeks your comments

All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres appeared in *CI*, Vol. 9, No. 1. p. 27 (1987).

Recommendations for EPR/ESR nomenclature and conventions for presenting experimental data in publications

In view of the extensive use of electron paramagnetic resonance spectroscopy in chemistry, physics and biology, it is desirable to encourage the use of consistent nomenclature and the presentation of experimental data in a uniform manner. The recommendations presented here contain definitions of basic terms, conventions and practices for data presentation in the area of this spectroscopy. This part A includes those pertaining to spectra of systems with $S = ½$. Nomenclatures include "EPR" as the standard abbreviation of the method, as opposed to commonly used "ESR". Recommended units for microwave frequency (gigahertz), the static and oscillating magnetic field (tesla) are based on the current usage in the SI system. Definitions and relations for g factor, the nuclear hyperfine coupling and the nuclear electric quadrupole coupling are given, and designations for their anisotropy in crystalline and powder samples are clarified. Required items of experimental conditions to be included in actual EPR data presentation in the text or in graphic presentation of EPR spectra are listed to facilitate accurate transfer of spectral data. This part does not include the areas pertaining to saturation transfer, double resonance and time domain techniques.

Comments on the report are welcome and should be sent before 30 September 1987 to Dr Hideo Kon, Room B1-14, Building 2, Laboratory of Chemical Physics, NIADDK/National Institutes of Health, Bethesda, Maryland 20205, USA.

Publications

New Green Book

The new edition of *Quantities, Units, and Symbols in Physical Chemistry* (the 'Green Book') has been compiled for the Commission on Physiochemical Symbols, Terminology, and Units, Physical Chemistry Division by I. Mills (Reading), T. Cvitas (Zagreb), K. Homann (Darmstadt), Nicola Kallay (Zagreb), and K. Kuchitsu (Toyko).

The first edition of the *Manual of Symbols and Terminology for Physiochemical Quantities and Units* of which this is the direct successor was prepared for publication on behalf of the Physical Chemistry Division in 1969. This book had as its objective the clarity and precision and wider agreement in the use of symbols by chemists in different countries, among physicists, chemists and engineers, and by editors of scientific journals. The second and third editions of the 'Green Book' were revisions to take account of various developments in nomenclature.

This present volume is a substantially revised and extended version of the earlier editions, with a slightly simplified title. These extensions include some of the material previously published in appendices, all the newer resolutions and recommendations on units by the Conférence Générale des Poids et Mesures (CGPM), and the recommendations of the International Union of Pure and Applied Physics (IUPAP) of 1978 and the International Organization for Standardization (ISO). The table of physical quantities has been extended to include defining equations and SI units for each quantity and the style has been changed from being a book of rules towards being a manual of advice and assistance for the day to day use of practising scientists.

The contents are:

Physical Quantities and Units
Tables of Physical Quantities

Definitions and Symbols for Units
Recommended Mathematical Symbols
Fundamental Physical Constants
Conversion of Units
References
Index of Symbols
Greek Alphabet
Pressure Conversion Factors
Additional References

The book will be published by Blackwell Scientific Publications Ltd, Oxford, UK, Summer, 1987. 126pp. ISBN 0-632-01773. Price £9.80 (approx.).

Metals in mercury

Volume 25 of the Solubility Data Series (see *CI*, Vol. 8, No. 5, pp. 25–29, 1986) is concerned with the solubility of metals in mercury, and includes all of the metals and the metalloids carbon, silicon and boron. The solubility only in the 76 binary amalgams is considered here. The compilation of the solubility data for these binary systems includes numerous reports, such as those published by the US Atomic Energy Commission from its various laboratories. The literature coverage for this volume extends through 1983.

The solubility of a metal in mercury at a given temperature is represented by the concentration of the saturated solution which is in equilibrium with the solid phase. The solid phase may be the pure metal, the metal saturated with mercury, or an intermetallic compound with mercury. This concentration also is represented by the liquidus point at the given temperature on the binary phase diagram. Clearly, the solubility also is represented by the crystallization temperature of the liquid amalgam.

Only those parts of the complete metal–mercury systems are included in which the solid metal, or a metal amalgam, appear as solid phases. In those systems where a phase diagram has been accurately determined, the equilibrium solid phase is clearly defined; the published phase diagrams for these systems are included in the Critical Evaluation, and should correctly aid the reader in assigning the solid–liquid equilibrium. However, there are some systems where there is disagreement on the equilibrium solid phase so that the solid–liquid equilibrium for these systems cannot be accurately defined. There are certain phase diagrams which have been constructed from precise data, but the liquidus data may be somewhat questionable because equilibrium may not have been attained during the short equilibration times employed. Instances of possible supersaturation in the determination of the liquidus from cooling curves are noted by the evaluators. In this volume, the emphasis is on accurate, evaluated solubility data rather than phase relations in the various systems.

Concentrations in the metal–mercury systems are mostly reported in atomic percent, at %, rather than in mole percent. The rationale for the non-SI unit is that each system is represented by the equilibrium of two atomic species, and much of the literature data on binary metallic systems are reported so.

The book is edited by C. Hirayama, Z. Galus and C. Guminski and published by Pergamon Press, Oxford, UK, 1986, xx + 451 pp. ISBN 0-08-023921-8. Price US-$100.00, £64.00.

Cationic polymerization

Invited lectures presented at the 7th International Symposium on Cationic Polymerization and Related Processes held at Friedrich Schiller University Jena, GDR, 12–15 August 1985 have been published as Vol. 3. of *Makromol. Chem., Macromol. Symp.* (1986).

Selected topics for the symposium were:

1. Cationic vinyl polymerization
2. Diene polymerization
3. Cationic ring-opening polymerization
4. Initiation processes in cationic polymerization
5. Reaction control of propagation in cationic polymerization
6. Cationic copolymerization
7. Sequential copolymers by cationic techniques
8. Polymer modification and degradation by cationic processes
9. New developments in anionic polymerization
10. Progress in ionic–coordinative polymerization

PAC Review

The first nanosecond

Most of the true photochemical processes of photosynthesis, that is to say those involving electronically excited states, occur in the first nanosecond following the absorption of light.

Time-resolved fluorescence and flash photolysis with transient absorption spectroscopy are now able to resolve the shortest times of interest but the spectra are complex, involving many components, and further progress depends on the separation and isolation of the various pigment–protein com-

plexes from the membrane. Rapid progress is being made in this area as well; a few of the components have been crystallized and, in three cases of great interest, structure determinations at the molecular level have been possible. We are therefore near to the situation where it will be possible to study the kinetics of very complex molecular aggregates in which the exact positions of the various components relative to each other are known.

The two principal kinetic processes of importance in photosynthesis are electronic energy transfer and electron transfer and there are separate pigment–protein complexes for each of these. Some of the most interesting systems studied, along with observations made, were presented in a plenary lecture entitled "Photosynthesis — the first nanosecond" by Sir George Porter (UK) at the 11th International Symposium on Photochemistry held in Lisbon, Portugal, 28 July–1 August 1986. Porter's paper covered light harvesting complexes (LHC), reaction centre of photosynthetic bacteria, reaction centres in green plants and model systems.

Pure and Applied Chemistry (PAC) *is the Official Journal of IUPAC*

The plenary and invited lectures at the symposium were published in the September 1986 issue of *PAC* (Vol. 58, No. 9). The plenary lectures also included "Radiationless transitions and photochemical reactivity," S. J. Formosinho (Portugal); "Topochemical photopolymerization of diolefin crystals," M. Hasegawa (Japan); "Optically transparent metallic catalysts on semiconductors," A. Heller (USA); "Photochemistry on surfaces," Oelkrug *et al.* (FRG) and "Photochemistry of organic molecules in microscopic reactors," N. J. Turro (USA).

Porous crystals

Crystals porous on the scale of molecules are found among aluminosilicates, crystalline silicas, aluminophosphates, expanded clay minerals, clathrates and metallocyanates. Properties shared by all types are host crystal stabilization by guest molecules; and shape-selective uptake of guest. Zeolites, expanded clay minerals, and porous aluminophosphates part substituted by Si or by metals, have catalytic properties, while zeolites and clay minerals share cation exchange properties. Some of these properties were illustrated and discussed by R. M. Barrer (UK) in a paper on "Porous crystals: a perspective" presented at the 7th International Zeolite Conference held in Tokyo, Japan, 17–22 August 1986.

However, zeolite structural chemistry is no longer confined to porous aluminosilicates. W. M. Meier (Switzerland) in a paper on "Zeolites and zeolite-like materials" outlined a wide range of zeolite-type framework structures following a generalized formula for zeolitic materials.

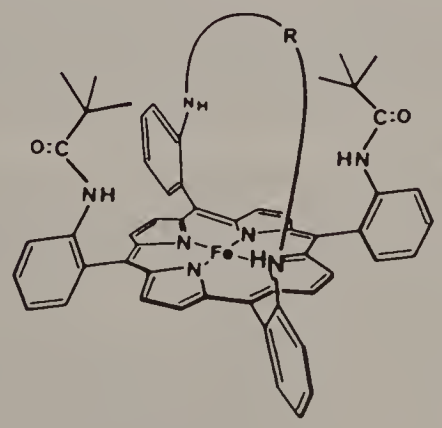
In another paper presented at this conference G. Gottardi (Italy) reviewed new achievements in the field of crystal chemistry of natural zeolites since 1983. These and other plenary and invited lectures were published in *PAC*, Vol. 58, No. 10, October 1986.

Basket-handle chemistry

This is no relation to bucket chemistry which was — and probably still is — widely practised in backyards by enterprising chemists. These basket-handles refer to superstructured iron(II)-porphyrins which have been designed to closely approach the properties of oxygen carrier hemoproteins and yield useful information concerning their biological structure and function.

"Basket-handle" porphyrins and "hybrid" porphyrins allow one to modify the constraint exerted on a chelated "proximal" base as well as to alter the chemical and steric environment of the distal side of the heme which controls selectivity of O_2 and CO binding. The presence of amide groups in the vicinity of the heme ring gives the possibility of forming a cavity to stabilize dioxygen or hydroxyl ion on iron(II) and carbon monoxide on iron(I).

The following is an example of a basket-handle porphyrin where R is typically $CO(CH_2)_{10}CO$:



Such structures are described in a paper by M. Momenteau (France) entitled "Synthesis and coordination properties of superstructured iron-porphyrins" presented at the 11th International Symposium on Macrocyclic Chemistry held in Florence, Italy, 1–4 September 1986.

The plenary and section lectures from this symposium were published in *PAC*, Vol. 58, No. 11, 1986.

Conferences

Biotechnology

The 4th European Congress on Biotechnology (ECB4) will be held in Amsterdam, The Netherlands, 14–19 June, 1987. European Congresses on Biotechnology (ECB) are the triennial highlights of the activities of the European Federation of Biotechnology (EFB). The EFB was founded in Interlaken at ECB1 (1978). Subsequent Congresses were held at Eastborne (ECB2, 1981) and Munich (ECB3, 1984). *Detailed information is available on request from Congress Secretariat: c/o Organisatie Bureau Amsterdam bv, Europaplein 12, 1078 GZ Amsterdam, The Netherlands. Tel: (31) 30 44 08 07; Telex 13499 raico nl.*

Physics conferences

The International Union of Pure and Applied Physics (IUPAP) has granted sponsorship to the following conferences in 1987. Names and addresses of organizers are shown in parentheses.

- Particles & Nuclei International Conference, Kyoto, Japan, 19–24 April (Prof. T. Yamazaki, Faculty of Science, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113, Japan).
- International Symposium on Magnetism of Intermetallic Compounds, Kyoto, Japan, 20–22 April (Prof. Y. Nakamura, Department of Metal Science and Technology, Kyoto University, Sakyo-ku, Kyoto 606, Japan).
- 8th International Conference on Laser Spectroscopy, Are, Sweden, 22–26 June (Prof. Sune Svanberg, Department of Physics, Lund Institute of Technology, PO Box 118, S-221 00 Lund, Sweden).
- International Conference on Luminescence, Beijing, China, 17–21 August (Prof. Xu Xuron, Changchun Institute of Physics, Xinmin Street 13, Changchun, P.R.C.).
- International Conference on the Applications of the Mössbauer Effect, Monash University, Australia, 17–21 August (Prof. J. D. Cashion, Department of Physics, Monash University, Clayton, Victoria 3127, Australia).
- International Conference on Amorphous & Liquid Semiconductors, Prague, Czechoslovakia, 23–28 August (Prof. A. Triska, Institute of Physics, Academy of Sciences, Na Slovance 2, 180 40 Prague 8, Czechoslovakia).
- International Conference on Fourier Transform Spectroscopy, Vienna, Austria, 24–28 August (Prof. R. Kellner, Technische Universität Wien, Getreidemarkt 9, A-1060 Vienna, Austria).

Asian Chemical Congress

The Korean Chemical Society will host the "Asian Chemical Congress '87 Seoul (ASHEM Seoul)" in Seoul, 29 June–3 July 1987. The subtitle of the congress is "Challenges in chemistry for Asian development". The congress will deal with all the aspects of chemistry, and consist of symposia on selected areas. The Asian Network for Analytical and Inorganic Chemistry will also be held separately during the congress. *Further information on the congress is available from The Secretariat, Asian Chemical Congress '87 Seoul, c/o The Korean Chemical Society, 35, 5-KA, Anam-Dong, Sungbuk-ku, Seoul 132, Korea. Tel. 94-5457, Cable: KCSRKS.*

HPLC

The 11th International Symposium on Column Liquid Chromatography will be held in Amsterdam, The Netherlands from 28 June to 4 July 1987. The symposium will cover all fundamental aspects, instrumental developments and applications of column liquid chromatography (HPLC) and related methods such as field flow fractionation, supercritical fluid chromatography and column electrophoresis. *For further information contact the symposium secretariat: Organisatie Bureau Amsterdam bv, Europaplein, 1078 GZ Amsterdam, The Netherlands. Tel: (31) 20–44 08 07, Telex: 13499 raico nl.*

The International Language of Chemistry

A conference on Chemical Structures: The International Language of Chemistry will be held 31 May–4 June 1987 at the Leeuwenhorst Congress Center, Noordwijkerhout, The Netherlands.

The conference will include papers relating to the following topics: substructure search methodology; chemical reaction searching; databanks; new technologies, including micros, optical disks, parallel processing and expert systems; access to integrated in-house databases; end-user searching and human factors.

The conference is being sponsored jointly by the American Chemical Society, Division of Chemical Information; the Chemical Structure Association and the Chemical Information Groups of the Royal Society of Chemistry and the German Chemical Society.

Further information and application forms are available from: Mr C. Citroen, Center for Information and Documentation, TNO, PO Box 36, 2600 AA Delft, The Netherlands.

Electroanalysis and Sensors

The Electroanalytical Group of the Analytical Division of the Royal Society of Chemistry, UK is organizing an International Symposium on Electroanalysis and Sensors in Biomedical, Environmental and Industrial Sciences, 6–9 April 1987 at UWIST, Cardiff, UK.

The programme will be on aspects of electroanalysis — including sensors, relating to biomedical, environmental and industrial sciences. Emphasis will be laid on methodology and applications of the various electroanalytical methods, especially regarding use of the various membrane and membrane-clad electrodes, gas sensors, biosensors, etc. Principles and methods of teaching electroanalysis to practitioners in the theme areas will also be included.

The final circular and registration form are available from: Short Courses Section (Electroanalysis Symposium), UWIST PO Box 68, Cardiff CF1 3XA, Wales, UK.

Radio Science

The 22nd General Assembly of the International Union of Radio Science (URSI) will be held in Tel Aviv, Israel, 25 August–2 September 1987. The URSI General Assembly is held once every three years and is a major event in the history of radio science.

URSI is one of 20 scientific unions which adhere to the International Council of Scientific Unions (ICSU). It consists of members from 40 countries from developed and developing parts of the world. The Peoples' Republic of China will be participating for the first time in the General Assembly in Tel Aviv.

As a satellite to the General Assembly a workshop on Beam Methods for High Frequency Radiation, Propagation and Diffraction — Theory and Applications will be held in Kiryat Anavim, Israel, 3–4 September 1987. *Further information from: Beam Workshop Secretariat, POB 50006, Tel Aviv 61500, Israel.*

IUPAC-Sponsored Conferences

6th International Conference on Boron Chemistry
Bechyně, Czechoslovakia, 22–26 June 1987

The conference is organized by the Institute of Inorganic Chemistry, Czechoslovakia Academy of Sciences, under the auspices of the Czechoslovak Academy of Sciences, IUPAC and the Czechoslovak Chemical Society. It will focus on recent developments of boron chemistry in the following areas:

Boranes, carboranes, heteroboranes and metallaboranes
Organic boron chemistry
Structure and bonding
Uses of boron compounds

There will be two parallel sections (organic and inorganic). The program will consist of invited plenary session and shorter session lectures.

The conference will be held at the House of Scientists of the Czechoslovak Academy of Sciences at Bechyně Castle, a resort located 100 km south of Prague.

Accommodation will be provided for the Conference registrants in the House of Scientists. Several social events and coach tours have been organized.

30th Prague Microsymposium on Macromolecules: Polymer-supported Organic Reagents and Catalysts
Prague, Czechoslovakia, 6–9 July 1987

This microsymposium has the following themes: (1) Synthesis, characterization and use of polymer reagents, carriers, protective groups and catalysts, (2) Relationship between polymer properties, on the one hand, and activity and selectivity, on the other, (3) Advantages and disadvantages of reagents and catalysts bound on the polymeric carrier in the application under various conditions. The specific topics are:

1. Synthesis of polymer reagents and catalysts by direct polymerization of functional monomers and by chemical transformations of natural and synthetic polymers.
2. Chemical reactions catalysed by polymer catalysts, such as ion exchangers, immobilized transition metal complexes, phase transfer catalysts, and solid cosolvents.
3. Polymer reagents in organic synthesis and in functional group protection.
4. The effect of chemical composition, physical properties and supermolecular structure on the function of polymer reagents and catalysts.
5. Synthesis, properties, and characterization of new types of polymer carriers.

6. Laboratory and technical use of polymer reagents and catalysts. Organic synthesis using immobilized enzymes. Solid phase synthesis.

All sessions of the microsymposium will be held in the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague.

Participants are invited to take part in the social events. For accompanying persons a special social programme has been arranged. Accommodation will be available in halls of residence within easy reach of the Institute by public transport.

3rd International Conference on Bioinorganic Chemistry
Noordwijkerhout, The Netherlands, 6–10 July 1987

The conference will have the following format:

Plenary lectures
Sessions lectures (mostly grouped together) in not more than two parallel sessions
Minisymposia (3–6 speakers on related topics) followed by discussion periods
Poster presentations

The plenary lectures are:

Bioelectrochemistry (H. A. O. Hill, Oxford)
Chemistry and molecular biology of platinum anticancer drugs (S. J. Lippard, Cambridge, USA)
Cytochromes P-450 and synthetic analogs (D. Mansuy, Paris)
Aspects of the chemistry of cytochrome *c* oxidase (G. Palmer, Houston)
Metal sequestering in bioinorganic chemistry (K. N. Raymond, Berkeley)

The following topics, considered to be part of bioinorganic chemistry, will receive special attention in minisymposia and groups of posters. In addition the organisers will invite about 20 session lecturers to highlight (other) aspects of bioinorganic chemistry, not necessarily related to these topics:

Metallothioneins
Nucleic acids and nucleotides
Photosynthesis
Non-heme iron biochemistry
Calcium biochemistry
Dioxygen
Electron transfer
Molybdenum biochemistry
Metalloporphyrins
Organometallics and Vitamin B12
Copper biochemistry and synthetis models
Medicinal aspects
Biomineralization
Aluminium in bioinorganic chemistry

The official language of the conference will be English.

The conference will be held in the Leeuwenhorst Congress Center at Noordwijkerhout. Housing will be in the same center. The conference center is located 4 km from the beaches of the North Sea, 12 km from Leiden and 28 km from Schiphol Airport (Amsterdam).

The social program includes a reception, concert, excursion and banquet.

The weather in the Netherlands usually allows summer clothing in July. The average day temperature is 21°C, but occasionally this can be as low as 12°C or as high as 30°C. Because of possible rainy periods, participants are advised to bring some weatherproof clothes and/or an umbrella and light coat with them.

10th Discussion Conference: Small-angle Scattering and Related Methods
Prague, Czechoslovakia, 13–16 July 1987

This is the 7th international meeting on small-angle scattering. It has the following themes: (1) Theoretical, methodical and experimental studies covering all fields of small-angle X-ray and neutron scattering, (2) Present-day state and new trends in the fields outlined in the topics, (3) Progress related to the application of new experimental techniques, such as synchrotron radiation, position-sensitive detectors and time resolved experiments, and achieved in the analysis and structural interpretation of data.

The specific topics are:

Theory and methods
Synthetic polymers
Biological systems
Applications in material science
Instrumentation

Panel discussions are planned on the following topics: (1) Data acquisition, treatment and interpretation, (2) Small-angle kinetic experiments.

All sessions of the meeting will be held in the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences.

All participants are invited to take part in the social events. For accompanying persons a special programme has been arranged. Accommodation will be available in halls of residence within easy reach of the Institute by public transport.

1st International Conference on Heteroatom Chemistry
Kobe, Japan, 19–24 July 1987

The overall theme of the conference will be "Reactions, Syntheses, Structures and Biological Activities of Heteroatom Compounds." Heteroatoms are taken to mean atoms other than carbon and hydrogen, such as boron, nitrogen, oxygen, silicon, phosphorus, sulfur, selenium and halogens. The most important purpose of the conference is to offer a common ground for those interested in communicating and discussing the seemingly diversified areas of chemistry of these various heteroatoms.

There will be plenary and invited lectures, oral presentations and posters. Plenary lectures will be delivered by:

R. Appel (FRG)
D. H. R. Barton (France)
J. I. G. Cadogan (UK)
R. Corriu (France)
A. Fava (Italy)
C. R. Johnson (USA)
W. Siebert (FRG)
W. J. Stec (Poland)
T. Wudl (USA)
B. Zwanenburg (Netherlands)

The official language of the conference will be English.

A variety of social events will be arranged for participants and accompanying persons.

The International Conference Center Kobe lies at the center of Port Island, Kobe. It is located 30 km west of Osaka City and can be reached by air (Osaka International Airport), railway and highway. Kobe has been an international city for over 100 years and is well provided with accommodation for visitors. The city is also close to the old historical cities of Kyoto and Nara.

12th International Symposium on Macrocyclic Chemistry
Hiroshima, Japan, 20–23 July 1987

The symposium is designed to cover various aspects of the chemistry of synthetic and naturally occurring macrocyclic compounds. The objective is to provide a forum for the presentation and discussion of research activities on macrocyclic compounds such as crown ethers, cryptands, polyamines, peptides and ionophores.

The symposium topics are:

- Synthesis
- Structures of free and complexed molecules
- Binding with organic cations, anions, and neutral molecules
- Biomimetic models
- Kinetics and thermodynamics of complexation
- Analytical applications
- Industrial applications
- Biological aspects

The symposium will consist of plenary lectures, a series of invited session lectures as well as poster presentations.

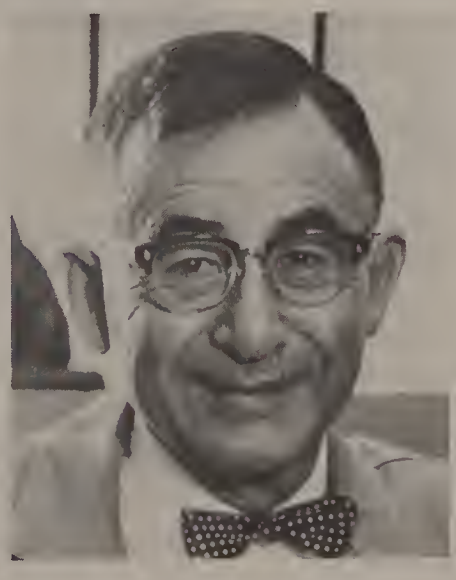
Since 1987 marks the 20th anniversary of the discovery of crown ethers a special session will be held to honor Charles J. Pedersen for his discovery.

The working language of the symposium and summaries of all lectures and poster contributions in the programme booklet will be English. The number of participants at the symposium will be limited.

Accommodation is being reserved in Kosei Nenkin Kaikan, where all sessions of the symposium will be held, and the nearby Tokyu Inn. The registration fee is ¥30 000 (Japanese Yen) for active participants. A surcharge of ¥5 000 will be charged for applicants after 1 March, 1987.

The middle of July is toward the end of the rainy season in Hiroshima and hence is usually warm and wet. The average temperature for the conference period is 25°C–30°C.

The history of Hiroshima began at the end of the



Dr Charles J. Pedersen who discovered crown ethers.

Kosei Nenkin Kaikan, venue for the Hiroshima Symposium.

16th century when the feudal lord Terumoto Mori built a castle on the mouth of the Ota River and named it "Hiroshima". Later, it prospered as a castle town and continued to grow as one of the leading cities of Japan. On 6 August 1946, Hiroshima experienced the first atomic bombing in the world and was reduced to ashes in an instant. However, it has been revived into a modern and most prosperous capital in the western part of Japan with a population growing to one million. There are many history-rich and unforgettable sightseeing spots in and around the city. These include the A-Bomb Museum on the site where the A-Bomb was dropped; Hiroshima Castle; Shukkeien Garden, a beautiful Japanese-style garden built over 300 years ago; Miyajima, the most celebrated and internationally known scenic spot in Japan and Seto Inland Sea, picturesque inland sea spotted with thousands of islands.

The A-Bomb Remains, ten minutes' walk from Kosei Nenkin Kaikan.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1987

Porous Solids

26–29 April. International Symposium on Characterization of Porous Solids. Bad Soden, Nr. Frankfurt, FRG. (Attn: Mrs C. Birkenberg, DECHEMA, PO Box 970146, D-6000 Frankfurt/Main 97, Federal Republic of Germany.)

Quantitative Luminescence Spectrometry

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in

Biomedical Sciences. Ghent, Belgium.
(Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan.
(CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–22 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanisms. Santa Margherita Ligure, Nr. Genoa, Italy.
(Prof. Savgerio Russo, C.N.R. Center on Macromolecules, Corso Europa 30, I-16132 Genoa, Italy.)

High Temperature and Energy-Related Materials

25–29 May. 5th International Conference on High Temperature and Engery-Related Materials. Rome, Italy.
(Prof. G. De Maria, Dipartimento di Chimica, Università di Roma "La Sapienza", P. le Aldo Moro, 5, 00185 Roma, Italy.)

Organosilicon Chemistry

7–12 June. 8th International Symposium on Organosilicon Chemistry. St. Louis, Missouri, USA.
(Prof. Peter P. Gaspar, Department of Chemistry, Washington University, St Louis, Missouri 63130, USA.)

Boron Chemistry

22–26 June. 6th International Conference on Boron Chemistry. Bechyně near Tabor, Czechoslovakia.
(Dr S. Hermanek, Institute of Inorganic Chemistry, Czechoslovak Academy of Sciences, 250 68 Rez near Prague, Czechoslovakia.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule "Carl Schorlemmer", Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands.
(Prof. J. Reedijk, State University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria.
(31st International Congress of Pure & Applied Chemistry, Centre of Chemistry, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Block 11, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Kobe, Japan.
(Prof. Michio Kobayashi, Secretary, ICHAC-1987, c/o Kinki Chemical Society, 1-8-4, Utsubo-Honmachi, Nishiku, Osaka 550, Japan.)

Macrocyclic Chemistry

20–23 July. 12th International Symposium on Macrocyclic Chemistry. Hiroshima, Japan.
(Prof. Eiichi Kimura, Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine , Kasumi 1-2-3, Hiroshima 734, Japan.)

Organometallic Chemistry

26–30 July. 4th International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS IV). Vancouver, B.C., Canada.
(Prof. Michael D. Fryzuk, Department of Chemistry, The University of British Columbia, 2036 Main Hall, Vancouver, British Columbia, Canada V6T 1Y6.)

Chemical Education

26–31 July. 9th International Conference on Chemical Education. Sub-title: 'Chemistry for our New World'. São Paulo, Brazil.
(Prof. Ernesto Giesbrecht, Instituto de Quimica, Universidade de São Paulo, Caixa Postal 20.780, 01498-São Paulo, SP, Brazil.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China.
(Prof. Xiao-Zeng You, Conference Secretary, XXV ICCC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany.
(Prof. J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Cationic Polymerization

10–14 August. 8th International Symposium on Cationic Polymerization and Related Processes. Munich, FRG.
(Prof. Oskar Nuyken, Lehrstuhl I für Makromolekulare Chemie, Universität Bayreuth, D-8580 Bayreuth, Federal Republic of Germany.)

Theoretical Organic Chemistry

12–19 August. World Congress of Theoretical Organic Chemists. Budapest, Hungary.
(E. A. Lang, WATOC CONGRESS, Hungarian Chemical Society, H-1061 Budapest, Anker Köz 1, Hungary.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark.
(Trace Elements in Human Health and Disease, Odense Tourist Association, Conference Department, The Town Hall, DK-5000 Odense C, Denmark.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria.
(6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan.
(Prof. Kazuo Akashi, Dept. of Metallurgy & Materials Science, Faculty of Engineering, The University of Tokyo, 7-3-1, Hongo, Bunkyoku, Tokyo 113, Japan.)

CHEMRAWN IV

4–9 October. "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources". Colorado, USA.
(Dr Derek W. Spencer, Associate Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA.)

Reduced conference fees for Affiliates

Organizers of the following conferences have agreed to a 10 per cent reduction in Conference fees for Affiliates:

- International Symposium on Characterization of Porous Solids (Bad Soden, Nr. Frankfurt, FRG, 26–29 April 1987)
- 2nd International Symposium on Quantitative Luminescence Spectroscopy in Biomedical Sciences (Ghent, Belgium, 11–14 May 1987)
- 2nd International Workshop on Behavior of Pollutants in Porous Media (Bet Dagan, Israel, 14–19 June 1987)
- 6th International Meeting on Boron Chemistry (Bechyně, Czechoslovakia, 22–26 June 1987)
- 31st International Symposium on Macromolecules (Merseburg, GDR, 30 June–4 July 1987)
- International Conference on Heteroatom Chemistry (ICHAC-1987) (Kobe, Japan, 19–24 July 1987)
- 9th International Conference on Chemical Education. Sub-title: 'Chemistry for our New World' (São Paulo, Brazil, 26–31 July 1987)
- 25th International Conference on Coordination Chemistry (Nanjing, China, 26–31 July 1987)
- 8th International Conference on Solute–Solute–Solvent Interactions (Regensburg, FRG, 9–14 August 1987)
- World Congress of Theoretical Organic Chemists (Budapest, Hungary, 12–19 August 1987)
- 2nd Nordic Symposium on Trace Elements in Human Health & Disease (Odense, Denmark, 17–21 August 1987)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1-5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubere, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-les-Nancy Cédex, France.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical And Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, Institute of Macromolecular Chemistry, Czechoslavak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia).

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto, 606 Japan.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Natori, Maiji College of Pharmacy, 1-22-1, Yatocho, Tanashi-shi, Tokyo 188, Japan.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical

Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

1990

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Workshops

1987

Pollutants in Porous Media

14–19 June. 2nd International Workshop on Behaviour of Pollutants in Porous Media. Bet Dagan, Israel.
(Dr Zev Cerstl, Institute of Soils and Water, Volcani Center, ARO, PO Box 6, Bet Dagan 50-520, Israel.)

Vapor–Liquid Equilibria

9–10 September. 3rd International Workshop on Vapor–Liquid Equilibria in *l*-Alkanol + *n*-Alkane Mixtures. Budapest, Hungary.
(Dr H. V. Kehiaian, Laboratoire de Chimie Organique Physique, Institut de Topologie et de Dynamique des Systèmes, Université Paris VII — C.N.R.S., 1 rue Guy de la Brosese, F-75005 Paris, France.)

IUPAC Handbook 1985-87

Supplement to *Chemistry International*

This Handbook, produced bi-annually, as a supplement to *Chemistry International,* provides detailed information on IUPAC, its personnel and IUPAC bodies. Significantly larger than previous Handbooks, this is a valuable reference source, appealing to chemists and chemical organizations worldwide.

Contents include: Full details of IUPAC Officers and Secretariat, Membership of all IUPAC Committees with full alphabetical index of names and addresses, Listing of all official current programmes of the various committees. Detailed information on the IUPAC Affiliate Membership Scheme.

1986. 262 pages. **£25.00 US$32.00** ISSN 0269-8757.

Blackwell Scientific Publications, P.O. Box 88, Oxford, UK

Standard Methods for the Analysis of Oils, Fats and Derivatives

Compiled by **C. Paquot**, Professor, formerly Chairman,
and **A. Hautfenne**, PhD, Vice-Chairman,
both of the Commission of Oils, Fats and Derivatives,
Applied Chemistry Division,
International Union of Pure and Applied Chemistry.

IUPAC

Published on behalf of the International Union of Pure and Applied Chemistry by Blackwell Scientific Publications

Prepared for the International Union of Pure and Applied Chemistry (IUPAC) Commission on Oils, Fats and Derivatives, this definitive reference work is designed for use in industry, trade and by international standards organizations. This volume contains more than eighty standardized methods prepared following collaborative studies at the international level in well-equipped laboratories and thus are suitable for adoption as reference methods. Many of the methods have been incorporated in legislation.

Further methods will be issued periodically as supplements in loose-leaf form for easy insertion in the binder. It is recommended that purchasers of this edition register their interest direct with the publisher who will keep them informed when supplements are published.

The volume comprises four sections: Oleaginous seeds and fruits; Oils and fats; Glycerines; and Alkaline soaps. Typical determination, after recommended sample preparation, includes physical and chemical characteristics using well-proven and modern techniques as well as monitoring of quality.

Seventh Edition. 1987.
366 pages,
16 illlustrations.
Cloth £55.00

ISBN 0 632 01586 1

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Osney Mead, Oxford OX2 0EL

International Union of Pure and Applied Chemistry (IUPAC)

IUPAC

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

National Adhering Organizations

Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
Asociación Química Argentina **(Argentina)**
Australian Academy of Science **(Australia)**
Verein Österreichischer Chemiker **(Austria)**
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Bulgarian Academy of Sciences **(Bulgaria)**
National Research Council of Canada **(Canada)**
Chinese Chemical Society, Beijing and Chemical Society located in Taipei **(China)**
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National Research Council, National Academy of Sciences **(USA)**
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Chemistry International

IUPAC

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1987, Vol 9, No 3 (May)

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Chemistry International

The news magazine of the International Union of Pure and Applied Chemistry (IUPAC)

EDITOR: Michael Freemantle
PRODUCTION EDITOR: Latha Menon

All correspondence to be addressed to The Editor, Chemistry International, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, England (telephone: + 44 (865) 717744).

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Advertising. Enquiries should be sent to the Advertisement Manager, Blackwell Scientific Publications Ltd, Osney Mead, Oxford OX2 0EL, England (telephone + 44 (865) 240201).

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Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*, unless there is a footnote to the contrary.

Front cover: A research laboratory at E. Merck, Darmstadt, FRG (see 'Contributions of chemistry to health', pp. 109–113).

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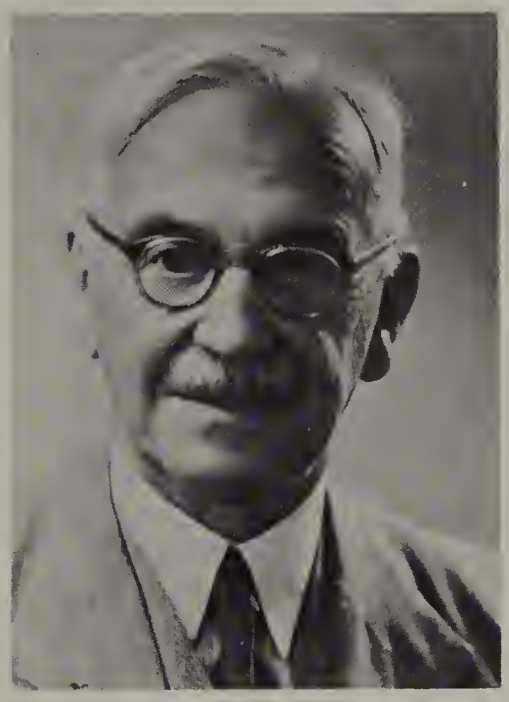
What is a scientist's responsibility?

The first ICSU General Assembly after World War II was held in London in July 1946. During the course of his presidential address at the assembly, the President, Prof. H. R. Kruyt, said:

"What is a scientist's responsibility? One may answer this question in two ways. One point of view is that it is limited only to the disclosure of truth, and that the application of its results is other people's concern. As long as we could maintain the optimistic point of view that any scientific result leads automatically to the benefit of mankind, there was little harm in this easy theory: but now that we are confronted with the most pernicious consequence of scientific research, we feel that we cannot confine ourselves to an 'Am I my brother's keeper?' And this leads to the other point of view, that scientific research implies an ethical responsibility.

Ethics and science are seldom discussed in their inter-relation, except in the case of medicine, where a man puts his life into the hands of his scientific fellow man. But medicine is no exception now that it becomes obvious that any science interferes with the fate of fellow men. We become aware of the truth of the story of paradise: as soon as man eats the fruit of the forbidden tree he eats from the tree of knowledge of good and evil, and that knowledge implies immediately ethical problems. Knowledge is inevitably a thing that may lead as well to evil as to good. Creation and dispersion of scientific knowledge therefore is a problem of responsibility.

Today science is confronted with a terrible responsibility. On one side it should develop and everything that can promote it should be favoured: intense research, publicity, etc. On the other side one shudders at the thought how terribly the results can be misused. Clearer than ever we understand that knowledge is not all, that we need morals and brotherhood to avoid science becoming a curse."



Prof. H. R. Kruyt, ICSU President 1945–46 and IUPAC President 1947–51: "We need morals and brotherhood to avoid science becoming a curse".

This General Assembly, in the name of the men of science represented, acknowledged the duty on the part of scientific workers:

a) to maintain a spirit of frankness, honesty, integrity, and cooperation and to work for international understanding;
b) to promote the development of science in the way most beneficial to mankind and to prevent its misuse;
c) to serve the community not only by their specialized work but by assisting so far as they are able in the education of the public in the purpose and achievements of science.

Taken from *The International Council of Scientific Unions: A Brief Survey* by F. W. G. Baker. 2nd Revised Edn (March 1986).
Published by ICSU Press. ISBN 0-930357-07-8.

News & Views

Over 5500 Affiliates in 1986

In 1986 a total of 5565 chemists from 40 countries registered as IUPAC Affiliates. The country-by-country breakdown was as follows:

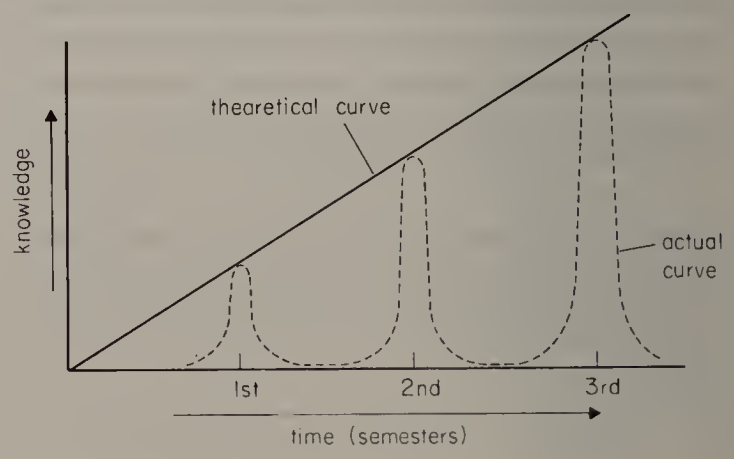
	No. of Affiliates
Algeria	2
Argentina	43
Brazil	20
Chile	16
China	21
Colombia	10
Denmark	15
Ethiopia	10
FRG	37
France	1
Ghana	6
Hungary	10
India	20
Ireland	5
Jamaica	1
Japan	323
Jordan	1
Kenya	17
Lebanon	1
Malaysia	66
Mexico	1
New Zealand	20
Nigeria	1
Papua New Guinea	24
Philippines	10
Republic of Korea	15
Saudi Arabia	1
Singapore	29
Solomon Islands	1
Sri Lanka	9
Sweden	6
Switzerland	3
Tanzania	1
Thailand	10
Turkey	58
UK	328
Uruguay	9
USA	4412
Yugoslavia	1
Zambia	1
Total	5565

AOAC President

In September last year, the Association of Official Analytical Chemists (AOAC) held its first Annual Meeting outside the borders of the Washington, DC area in Scottsdale, Arizona, USA. Leaders in the field of analytical science attended a variety of extensive symposia, current issue discussion programs, technical poster sessions, a Quality Assurance short course, and viewed an exposition featuring over 85 exhibits displaying the latest in laboratory technology.

During the Annual Meeting's opening session, Frank Johnson, of the Tennessee Valley Authority, was announced as AOAC's President for 1987. Albert Tiedemann, Director of the Virginia Division of Consolidated Laboratory Services, was named the newest member of the AOAC Board of Directors. Wallace Andrews, a microbiologist with the Food and Drug Administration, and General Referee of Food Microbiology, was awarded the title of "General Referee of the Year" for his outstanding work in overseeing four method recommendations and in receiving approval for five collaborative studies.

Experience of a well known IUPAC professor about students in general



Learning $(L) = k_1 e^{k_2 t}$

Forgetting $(F) = k_3 e^{k_4 t}$

where k_1 and k_3 are personal constants k_2 and k_4 are universal constants.

Knowledge $= L - F =$ unfortunately, only a small residual permanent knowledge!

New European scientific society founded

The European Society for Photobiology (ESP) was founded at an inaugural meeting held during the First European Congress of Photobiology in Grenoble, France, 8–12 September 1986. The Congress was attended by over 400 scientists. The aim of this new society is to stimulate and facilitate the interchange of ideas between European (and other) investigators interested in the various disciplines of photobiology.

ESP will integrate the entire range of disciplines including photosynthesis, vision, photomedicine, photomovement, radiation damage and repair, photomorphogenesis, photosensitization, spectroscopy, phototechnology, and appropriate aspects of photochemistry. The adequate representation of these and other related topics within ESP will take precedence over other considerations and thematic sub-groups will be established by the executive committee in the near future.

Membership is open to all Europeans and non-Europeans interested in photobiological research and those who wish to apply for membership should send the annual fee of 20.– Sfr to the treasurer, Dr Rex M. Tyrrell, Swiss Institute for Experimental Cancer Research, CH-1066 Epalinges S/Lausanne, Ch. des Boveresses, Switzerland.

At the founding meeting in Grenoble the first Executive Committee was elected as follows: T. G. Truscott (UK) President, K. Schaffner (FRG) Past-President of founding committee, H. Honigsmann (Austria) President-Elect, J. Cadet (France) Secretary, R. M. Tyrrell (Switzerland) Treasurer, L. Szalay (Hungary) Member. In addition, G. Jori (Italy) was appointed as chairman of the publications committee and co-opted to the executive committee.

The Second Congress of ESP will take place at the University of Padua, Italy, 6–11 September 1987. For further information please contact Prof. G. Jori, Department of Biology, via Loredan 10, 35131 Padova, Italy.

New National/Regional Centre in Poland

The following National/Regional Centre has now been added to the list published in *CI*, Vol. 9, No. 1, p. 27 (1987).

Poland
Prof. O. Achmatowicz, Jr,
The Polish Chemical Society,
ul. Freta 16,
00–227 Warszawa,
Poland

IUPAC People

New COCI Secretary

Prof. A. Fischli has been appointed Secretary of the Committee on Chemistry and Industry (COCI). He succeeds Dr G. Jäger. Prof. Fischli's address is F. Hoffmann-La Roche & Co. AG, CH-4002 Basel, Switzerland.

Awards for IUPAC chemists

Congratulations to Prof. David Whiffen who has received the Sir Harold Thompson Memorial Award for his paper entitled "Spectroscopic constants evaluated by numerical contact transformation". Whiffen, who retired in 1985, was Pro-Vice-Chancellor at Newcastle University, UK and President of the Faraday Division of the Royal Society of Chemistry (UK). He is the new Chairman of the *PAC* Editorial Advisory Board and has also served IUPAC in other capacities. The award was presented in memory of Sir Harold Thompson who was editor of *Spectrochimica Acta*. Sir Harold was President of IUPAC 1973–75.

Congratulations also to Applied Chemistry Division President Dr Philip C. Kearney for being selected as ARS Distinguished Scientist of the year in 1986. ARS is the Agricultural Research Service (USA). Kearney is Research Leader, Pesticide Degradation Laboratory, Agricultural Environment Quality Institute, Maryland. The award was made in recognition of his innovative leadership and creative research on chemical and biological methods for the destruction of pesticide wastes to reduce hazards of groundwater pollution by agricultural chemicals.

Dr Philip C. Kearney.

Prize for Solubility Data Commission member

Congratulations to Prof. R. Cohen-Adad (France) for receiving the 1986 award of Le Prix Poisson de l'Académie Française. Prof. Cohen-Adad is a Titular Member of the Commission on Solubility Data (V.8). He was awarded the prize for his work on the chemistry of hydrazine.

Address changes

Dr A. Cornish-Bowden (Secretary, JCBN): CNRS–CBM, 31 Chemin Joseph-Aiguier, B.P. 71, 13402 Marseille Cedex 9, France.

Prof. M. Mandel (Chairman, Commission IV.2): Department of Physical and Macromolecular Chemistry, Gorlaeus Laboratories, University of Leiden, PO Box 9502, 2300 RA, Leiden, The Netherlands. Tel: +31 (71) 27 42 35.

Prof. G. den Boef (Secretary, Division V): Tel: +33 (20) 5256515.

Prof. M. Ringpfeil (Chairman, Commission VI.2): Forschungsbereich Biowissenschaften und Medizin, Robert-Rössle-Str. 10, 1115 Berlin, GDR. Tel: +37 (34) 62206. Telex: 112625 awfmm dd.

Dr H. F. Wilson (Chairman, Finance Committee): PO Box 2152, Cape May, NJ 08204, USA. Tel: +1 (609) 884 6290.

A typical day in the life of Prof. Joseph F. Bunnett

The everyday existence of Prof. J. F. "Joe" Bunnett is undergoing change, and he isn't quite sure how it's going to work out. Until 30 June 1986 he was Editor of *Accounts of Chemical Research*, the journal of short reviews of which he was the founding editor, starting the job in 1966. The journal work required him to have the assistance of a secretary, but now he's on his own, much as are the other professors in the Board of Studies in Chemistry at the University of California, Santa Cruz. He will be able to get some secretarial assistance from ladies in the Board office, 150 meters away, but that won't be quite the same as having a private secretary in the office next door. He is a little apprehensive as to how he will be able to keep abreast of the flood of IUPAC correspondence in his new situation.

In the Chemistry Board at Santa Cruz, he is one of 11 Professors; there are also three Assistant Professors, and one vacancy soon to be filled. Except for the Board Chairman, an office that rotates among the Professors, all 15 have similar responsibilities and access to resources. They have similar teaching assignments, similar allocations of laboratory space, and all are largely dependent on extramural grants for the funding of their research.

During the recent year, Joe Bunnett taught a graduate course in organic reaction mechanisms (his specialty) in the Fall quarter, an undergraduate course in organic chemistry for biologists in the Winter quarter, and a course in elementary quantitative analysis in the Spring quarter. His research group comprises one graduate student nearing her PhD, a postdoc from Argentina, two visiting scientists from the People's Republic of China, and three undergraduate students. Research funding comes mainly from the National Science Foundation. His research is currently much concerned with reactions in which electron transfer steps are crucial.

Prof. J. F. "Joe" Bunnett, President of the Organic Chemistry Division, without his horse, at the Lyon General Assembly in 1985.

Apart from work for IUPAC as President of the Organic Chemistry Division and earlier as Chairman of Commission III.2 on Physical Organic Chemistry, Joe supports IUPAC as a member of the United Stateś National Committee for IUPAC. He is also a member of the Chemistry Section Committee of the American Association for the Advancement of Science, and a Trustee of Reed College, the liberal arts college in Oregon where he took his BA degree.

His typical day starts at his home overlooking Monterey Bay. After a simple breakfast of fruit, cereal, English muffin and coffee, he sometimes works several hours in his study at home, in which he has long runs of several major journals in his field, professionally bound. This significant private library provides a good basis for the preparation of lectures and the composition of manuscripts for publication. He and his wife invested four years ago in their own computer (an Alspa); he has a terminal in his study, and finds the computer to be a great help in scientific writing.

Joe prefers to arrange his teaching at early morning hours, preferably at 8.30; he drives some 5 km to the campus, entering a redwood forest as he approaches the main university buildings. (The "coast redwood", properly known as *Sequoia sempervirens*, is a handsome forest tree — sometimes 100 meters tall — and is highly prized in California.) After teaching, consulting with research coworkers in their laboratories, and attention to correspondence in his office, he strolls off to lunch at one of the restaurants on campus, usually on trails through the redwood forest. Afternoons are normally spent on campus at research or correspondence. He is usually home for dinner at six o'clock, and spends most of the evening reading scientific literature.

Affiliates in Japan

In 1986 over 300 chemists in Japan registered as IUPAC Affiliates through the Chemical Society of Japan. *Chemistry International* asked some of them what they did and why they decided to become Affiliates.

In Japan, the Affiliate Membership Scheme is operated by the Chemical Society of Japan. The Japanese Affiliate Membership Secretary is Dr Hiroshi Hamada, Executive Director of the Society. Early last year he sent the first list of Japanese Affiliates to the IUPAC Secretariat in Oxford. By December the total number of Affiliates in Japan was 323.

Yukitoshi Fukuda is a research worker at Kyowa Yuka Co. Ltd in Yokkaichi. Kyowa Yuka is a subsidiary company of Kyowa Hakko — one of 59 IUPAC Company Associates in Japan (see *CI*, Vol. 8, No. 1, p. 26 (1986)). Fukuda is working on the development of industrially useful reactions, especially transition-metal-catalysed carbonylations with carbon monoxide. He has been familiar with IUPAC, particularly its nomenclature, since his undergraduate days. He has also participated in the IUPAC-sponsored conferences OMCOS II and III. Fukuda hopes that the information provided through the Affiliate Membership Scheme will benefit both himself and his company.

Masahiro Adachi works for the Sharp Corporation on liquid crystal displays. He registered a specific interest in the work of the Commission on Molecular Structure and Spectroscopy (I.5). Adachi believes that "IUPAC is an indispensable organization for the international chemist".

It was about 20 years ago that Masaaki Yoshifuji first learned about IUPAC and its international activities. Yoshifuji, who is a research associate in the Department of Chemistry of The University of Tokyo, is currently working on unusual organophosphorus compounds in lower coordination states. He has attended several IUPAC meetings both in Japan and abroad.

As a confirmed "chemistry internationalist" Akiko Furuhashi hopes that the Affiliate Membership Scheme will enable her to widen her contacts with chemists around the world. While continuing her research into the properties and synthesis of new metal complexes, Prof. Furuhashi is becoming more involved in problems of chemical education. She says that "there are lots of enemies of chemistry". More effort is needed to encourage public understanding of the importance of chemistry. Furuhashi is a professor of chemistry at Aoyama Gakuin University, Atsugi.

Hiroshi Hada is Professor of Physical Chemistry in the Department of Industrial Chemisty, Kyoto University. He is now carrying out studies on the photochemistry of solids and solid surfaces, including photographic sensitivity, dye sensitization and photocatalysis of semiconductors. As might be expected, he registered a specific interest in the work of the Commission on Photochemistry (III.3). Hada, who has presented two papers at IUPAC-sponsored conferences in Japan, hopes that the Affiliate Membership Scheme will help to keep him informed about international meetings and trends in chemical research in the world.

"I first heard about IUPAC 24 years ago when I was an undergraduate", says Hiromiti Sawamoto, who is a professor at the Faculty of Education, Kochi University. Sawamoto has been teaching chemistry at the undergraduate level for about 17 years. He is currently doing research in electroanalytical chemistry and is particularly interested in electrochemical stripping analysis employing adsorption preconcentration. In November 1986 he presented a paper at the IUPAC-sponsored International Symposium on New Sensors and Methods for Environmental Characterization held in Kyoto.

Fukiko Yamada always gives a short history of the nomenclature of organic compounds at the beginning of her lecture course on organic chemistry in the department of Applied Chemistry, Kansai University, where she has been Professor since 1972. Yamada, whose special interests are antioxidants and heterocyclic chemistry, believes that chemistry teachers must keep themselves informed of chemical problems throughout the world and hopes that the Affiliate Membership Scheme will help her in this way.

Affiliates in Japan

◀ Yukitoshi Fukuda.

Akiko
▼ Furuhashi.

◀ Masaaki
Yoshifuji.

Hiroshi Hada. ▼

▲ Hiromiti Sawamoto.

◀ Fukiko Yamada.

Degradation and stabilization of polymers

Prof. G. E. Zaikov

CHEMRAWN VI, which will be held in Japan in 1987, will be devoted to advanced materials — including polymeric materials — for innovations in computing, transport and communications. This paper by Prof. Zaikov deals with the degradation and stabilization of polymeric materials with a view to improving their characteristics and properties for future use.

Improving the properties of polymeric materials

At present the world's annual output of polymers is about 100 million tons. It is estimated that by the year 2000 production will double. The volume (not weight) of polymers produced at present matches that of steel, cast iron or rolled metal.

Given such large-scale production, the quality of the articles produced is of paramount importance. Prolonging the service life of polymeric articles twofold is tantamount to doubling their production. This is an important economic goal.

Quantitative predictions of stability of polymeric articles is thus important. If we underestimate the service life of polymeric articles, they may be withdrawn from use whilst still reliable. This is not economical. On the other hand, overestimating their useful life may result in a failure of a polymeric article. This could lead to serious consequences.

Degradation can be used as a means of modifying polymeric articles. This method is applied, for example, in the hydrolytic degradation of the surfaces of cellulose acetate fibres. It is thus possible to obtain antistatic, non-contaminative, strong-coloured fabrics. This is because electric charges flow off the surfaces of fibres with hydroxyl groups more easily then those with acetate groups. The surface properties of polymeric articles can thus be modified without changing the mechanical properties of the polymer.

Treatment of polymeric films can increase their roughness. This is important for various fields of technology, for example, in the production of "eternal" polymeric paper and high-quality tapes which retain information better.

Chromatography and mass spectrometry investigation of polymer degradation.

Prof. G. E. Zaikov is Head of the Polymer Degradation and Stabilization Centre at the Institute of Chemical Physics, USSR Academy of Sciences, Moscow. He was a member of the CHEMRAWN Planning Committee, 1975–83.

Irradiation of polymeric films with subsequent hydrolysis of molecular fragments produces excellent micropores with a specific pore size.

Polymeric waste

Let us now consider the secondary use of waste and used polymeric articles. Increasing amounts of these make the secondary processing, monomer regeneration and pyrolysis of polymeric waste to produce gaseous fuel increasingly important fields of study. They are important not only because of environmental protection but also because we now have to go deep into the sea, deep into the earth and far into the uninhabited regions of the North to extract oil. Although oil prices are temporarily falling, they are expected to start growing again in the long term.*

Interesting results were obtained by American scientists in 1982. They analysed the composition of plastic garbage collected over a month on a 10 × 87 m section of Rhode Island. The island lies in the Atlantic Ocean 330 km from New York.

The problem of such polymeric waste is especially acute in densely populated areas with highly developed polymeric materials industry. These include countries such as Japan and West Germany and some regions in the United States for example. Prof. Yu. A. Shlyapnikov has estimated that if, one fine day, all the inhabitants in Moscow and its region's inhabitants threw away all their polymeric waste — bags, films,

*Future sources of organic raw materials and prospects for oil extraction and processing were thoroughly analysed at the CHEMRAWN I (Toronto, 1978) and CHEMRAWN III (The Hague, 1983) Conferences.

Plastic collected from a Rhode Island shore in one month.

	Articles	Material	Weight (g)
1.	Drinking glasses (16 pieces)	PS	14
2.	Removable lids of beer cans	PELD	11
3.	Bleaching containers (2)	PEHD	226
4.	Vessels for holding drink	PEHD	179
5.	Pieces of a buoy	PEHD	30
6.	Sweet wrappers	cellulose packing films	12
7.	Rope (6 parts)	nylon	55
8.	Plastic drinking tubes	PP	1
9.	Plastic bags for food	PELD	167
10.	Fishing-lines	AVS	24
11.	Doll's arm	PVC	4
12.	Pieces of a tray	AVS	22
13.	Gloves	PVC	34
14.	Thread	nylon	6
15.	Sticking tape	PVC	10
16.	Cartridges	PE	8
17.	Pieces of a basket	AVS	3
18.	Cable claddings	PVC	12
19.	Forks	AVS	2

PS — polystyrene; PELD — low-density polyethylene; PEHD — high-density polyethylene; PP — polypropylene; AVS — plastics; PVC — polyvinyl chloride; PE — polyethylene.

bottles, packets, for example — the amount discarded would be enough to cover the whole of the Moscow Region several times. (It is just as well Muscovites resist the temptation!)

The burning of polymeric waste at dumps is now prohibited in the Soviet Union since it leads to generation of poisonous substances, including prussic acid (hydrogen cyanide, HCN). It is appropriate to cite here Jack Ive Kusto's words that the globe may be compared to "a lone car driving in space with its exhaust pipe inside the cabin". Prof. D. Barton wittily summed up the present situation concerning environmental protection with the following statement: "Either people manage to reduce the amount of smoke in the air, or the smoke will cause the reduction of the Earth's population".

Head office of the Institute of Chemical Physics, Academy of Sciences, Moscow.

In the mid-1960s Prof. J. Guillet of the University of Toronto (Canada) and then Profs J. Kagia (Japan), V. Ya Shlyapintokh and B.A. Krentzel (USSR) developed procedures for producing dispensable polymeric articles. They synthesized self-degradable polymers. Their aim was to produce polymers consisting of stable blocks linked by "joint" groups, which were stable whilst in use but unstable after use. These "joint" groups were normally unstable in the presence of light and could be hydrolysed. The polymers thus decomposed to form oligomer blocks which were soluble in soil and could be degraded by bacteria. Unfortunately, the rise in oil prices in the 1970s prevented the wide application of these dispensable articles. However, we hope that these polymers will be widely applied in agricultural. For example, it may be possible to irrigate arid lands with solutions of these polymers in order to form polymer films on the soil surface. These would then act as a hothouse which could retain both heat and moisture in the soil and protect it from erosion. Having served as a protective coating in spring, the film would then decompose and disappear without environmental pollution.

At present, secondary polymers are best used by processing them into lower quality polymeric articles. Although a polymeric article may have been completely used for certain purposes, it may be still used for others.

A kinetic approch

A study of the kinetics of polymer degradation can help us to gain insights into the degradation mechanisms at

◄ Investigation of the photodegradation of polymers.

▲
Use of lasers to investigate photostability of polymers.

An experiment on PVC degradation. ►

the quantitative level. A knowledge of the complex degradation mechanisms in a real polymer will help us to control the process. By a real polymer, I mean a multicomponent system, including the polymer stabilizers, plasticizers, dyes, fillers and so on.

It is well known that the structure of a real polymer differs greatly from the ideal structure. It is the latter which is normally a subject of scientific papers. However, there are many defects in any macromolecule. These include double bonds, tertiary carbon atoms, oxygen-containing groups and so on. These may affect the physical and chemical properties of the material. For example, the thermal and thermo-oxidative stability of PVC with the formula $(CH_2–CHCl)_n$ is higher than that for real PVC polymers. In view of this, an IUPAC Working Group was formed to study defects in PVC and their correlation with stability.

Profs K. S. Minsker and Al. Al. Berlin (USSR) independently showed that PVC instability was due to the accumulation of carbonyl alkyl groups during its formation. Its stability could thus be increased by "removing" these groups from the macromolecule.

At present a great number and variety of stabilizers have been developed for polymers. Many firms produce them. Development in this area will probably focus on polyfunctional stabilizers, their synergistic mixtures and stabilizers built into polymer molecules. Lower stabilizer prices will be of great importance from an economic viewpoint. The current cost of a stabilizer (by weight) is 10 to 100 times higher than that of the stabilized polymer itself. Recently, good progress has been made in developing new mechanisms of synergism. Their use in practice will be profitable both in terms of extending the service life of polymeric materials and in terms of reducing the amount of applied stabilizers.

There are still many aspects of the mechanisms of degradation of various polymers that are obscure. However, it would be wrong to wait till we gain a clear insight into these mechanisms and only then make attempts to design new methods of stabilization. Engels stated in his *Dialectics of Nature* that if we decided to wait until we have all the data needed to formulate a law we would never obtain the law.

Commission & Committee News

Committee on Teaching of Chemistry

When it met in Rome, Italy, 10–11 September 1986, the Committee on Teaching of Chemistry (CTC) recorded its deep sorrow at the sad demise of Professor G. Illuminati, a former CTC member from Italy.

An international workshop was held in Bombay in 1985 to evaluate the new equipment (e.g. colorimeter, polarograph, thermometer and polarimeter) developed under the IUPAC/Unesco Low Cost Equipment Project at Delhi University. A three-year teacher training programme involving fabrication of low-cost equipment is being initiated in Thailand, Philippines and Indonesia under the auspices of IUPAC and Unesco. The first Workshop was held in Thailand, 2–8 October, 1986. Another Workshop based on the Delhi Project was held at Islamabad, Pakistan, 15–20 December, 1986.

A new working party has been formed to examine further the matter of CTC involvement in the International Chemistry Olympiads based on the report of the earlier working party. CTC collaboration with Unesco in producing "New trends in chemistry teaching", Volume VI, is to be explored. CTC collaborated with Unesco in the regional workshop held at the University of Zimbabwe. The workshop was devoted to the use of microcomputers in chemical education. CTC is to collaborate wth ICSU and Unesco in the follow-up programme to this workshop. The final draft of the *Safety in Schools* booklet is ready. It will be published in collaboration with Unesco.

K. V. Sané

Approval of Periodic Table

When the Interdivisional Committee on Nomenclature and Symbols (IDCNS) met in Witney, UK, 31 August–1 September 1986 it reviewed the nomenclature, terminology, and symbols work of the IUPAC Divisions and related international bodies. A revised version of the *Manual of Symbols and Terminology for Physicochemical Quantities and Units* was examined in detail, particularly in the context of existing IUPAC documents that might be in conflict with changes in the new manual. It was agreed that affected Commissions should have an additional period for comment before final IDCNS review. It was also agreed that compendia of existing IUPAC documents need not go through the usual publications review process.

The Committee reaffirmed its approval of the Periodic Table with row headings 1–18, but it was pleased to learn that the revised "Red Book" (*Nomenclature of Inorganic Chemistry*) would have an appendix showing existing Periodic Table forms for comparison.

Specific terminology and symbols problems were discussed. These included the use of the symbol "V" for both volume and limiting velocity or reaction rate, preferences for "L" or "l" as the symbol for litre and the use of "," rather than "." as the decimal symbol.

Strong cross-representation between the Publications Committee and IDNCS has been set in place, and it was agreed that the Chairman of IDCNS should nominate a representative on the *PAC* Editorial Advisory Board. The publication review process for documents produced by IUPAC Commissions was reported to be working very well; some 19 worldwide regional centres are now operating to publicize and distribute provisional versions of IUPAC documents. The *Compendium of IUPAC Terminology* is expected to be complete in 1987.

Robert B. Fox

IDCNS meeting in Witney.

Nomenclature of Organic Chemistry

Comprehensive documentation of recommendations in four major subject areas was reviewed at the meeting of the Commission on Nomenclature of Organic Chemistry in Heidelberg, FRG, 23–29 August 1986. Recommendations on nomenclature for radicals, ions, radical ions, and related species and for fused and bridged–fused ring systems are nearly ready for the review process. Drafts on nomenclature recommendations for natural products and related species and a glossary of structure-based class terms in organic chemistry continue to develop.

The revision of the 1979 edition of the *Nomenclature of Organic Chemistry* occupied a large amount of the Commission's time in Heidelberg. Part I, which will give the basic principles for deriving unambiguous, though not necessarily unique, names for organic compounds, was thoroughly reviewed. An appendix will list the trivial and semi-systematic names recommended by the Commission. Each such name is being carefully considered from several aspects including frequency of use and usefulness in communication, both general and scientific. Selected topics for Part II, which will provide rules for deriving a unique IUPAC name, continue to be evaluated.

Nomenclature for phanes, as used at the Beilstein Institute, has been documented and is being evaluated. The extension of Rule A-21.6, the use of indicated hydrogen, to bridged–fused ring systems, spiro ring systems, and ring assemblies is under study. Other projects of the Commission include acid nomenclature, nodal numbering, stereochemical terminology and nomenclature (Section E) and methods for naming hydrogenated fused ring compounds substituted by principal characteristic groups.

Warren H. Powell

Naming transformations and symbolizing reaction mechanisms

The Commission on Physical Organic Chemistry began its business at its Tokyo meeting, 21–23 August 1986, by noting with sadness the deaths during the preceding year of Victor Gold, Commission Chairman at the time, Gabriello Illuminati, a founding Titular Member, and Associate Member A. K. Maltsev.

The main business of the meeting was to finalize the draft report on naming transformations in the light of referees' comments. This work was one of the earliest projects of the Commission and has taken ten years to reach the stage where it is ready for submission to IDCNS.

The Commission also discussed comments that had been received on its two reports on symbolizing reaction mechanisms: one deals with a simple systematic scheme designed to replace the increasingly inadequate Ingold symbolism; the other is a more detailed system that can describe a mechanism in a linear string suitable for computer storage and retrieval. Both reports are now available from regional centres. The Commission hopes to have all three documents ready for final publication after the Boston General Assembly.

New projects and feasibility studies include: guidelines for publication in physical organic chemistry; guidelines for the presentation of quantum chemical and computational data; and critical compilations of structure–reactivity parameters and of the physical properties of short-lived intermediates. The Commission is also preparing to extend and revise its well-received *Glossary of Terms used in Physical Organic Chemistry*.

Richard A. Y. Jones

Good progress with HPLC methods

40 Commission members and invited observers, from18 countries, participated in the meeting of the Commission on Oils, Fats and Derivatives held at the Österreichischer Ingenieur- und Architekten-Verein, Vienna, Austria, 2–4 September 1986.

Consideration of the reports on the outcome of the collaborative studies on methods for fatty acids by capillary column GLC and tocopherols by HPLC indicated that the methods were close to standardization. Some difficulties were experienced with the HPLC methods for the determination of trigylcerides (as ECNs) and polymerized oils, and the method for the determination of the colour of lecithins — work on these methods would continue. Results from the preliminary investigation into a proposed HPLC method for lecithins were encouraging.

It was reported that the text of the previously standardized method for the determination of copper, iron and nickel by AAS, along with the report of the collaborative study, had now been finalized and it is hoped that publication will be early in 1987.

The texts of the following standardized methods are now all at a late stage of drafting: lecithins by TLC and phosphorus analysis; solvent residues (free and total) in extraction meals; solvent residues in oils; emulsifiers by GLC.

The Commission has recognized the need, in order to avoid unnecessary duplication of analytical work, to consider adopting methods published by other standards organizations. Acceptance criteria guidelines have been drafted and these were taken into account when the Commission agreed to adopt the AOAC method for the determination of antioxidants by HPLC.

The feasibility of organizing a Commission-sponsored workshop/symposium in 1988 was considered.

The Commission's *Standard Methods for the Analysis of Oils, Fats and Derivatives*, 7th edn (Blackwell Scientific Publications) was published in December 1986.

The excursion to Hungary which followed the meeting proved most enjoyable and instructive — included was a visit to Budapest and a tour of a sunflower seed crushing plant and refinery.

A meeting of the Commission's working groups will be held in Munster, Federal Republic of Germany, 7–9 July 1986. A full Commission meeting will take place at the IUPAC 34th General Assembly in Boston, USA (21–29 August 1987).

W. D. Pocklington

Automation and Clinical Chemical Techniques

The Commission on Automation and Clinical Chemical Techniques met in Bremen, FRG, 16–18 May 1986, to appraise its working relationships with IFCC (International Federation of Clinical Chemistry), particularly on the educational front, and to assess the status of draft project reports. Division members' comments on the following documents were collected and assessed, so that revised versions could be prepared and distributed:

Bioanalytical Nomenclature (Dr C. A. Burtis)
Classification of Analysers (Prof. P. Bonini)
Carry-over Effects (Dr R. Haeckel)
Nomenclature of Electronic Data Processing (Prof. P. Bonini)

In addition, the document "Nomenclature for Automated and Mechanized Analysis" (Prof. M. Hjelm, jointly with members of Commission V.3) has been widely reviewed, and a final version is in course of preparation, taking account of the (provisional) recommendations of Commission V.3 on Nomenclature of Sampling.

Plans have been developed for a project on the analytical applications of genetic engineering, in the expectation that a specialist in this field will shortly be nominated to fill the vacancy for a Titular Member. Such a project is intended to complement the activities of the reconstituted Commission on Biotechnology (VI.2).

Preliminary arrangements have been made for the Commission to participate in a Workshop on Analytical Instrument Systems to be held in conjunction with the IFCC International Congress of Clinical Chemistry, The Hague, 28 June–3 July 1987. The Commission is also seeking IUPAC co-sponsorship for the Third International Congress on Automation and New Technology in Clinical Chemistry, to be held in Kobe, 1988.

T. D. Geary

Atmospheric chemistry projects commence

The Commission on Atmospheric Chemistry, convening in London, UK, 4–5 September 1986, devoted much attention to the initial results of two projects started last year.

The response to a questionnaire on objectives, methodology, measuring strategy and quality control from about 40 networks concerned with environmental studies was presented. Quality control and objectives of networks differ considerably to the extent that harmonization is certainly necessary. The inventory is not yet complete. It is expected that all information will be available at the end of 1987.

The first draft of a very extensive glossary of atmospheric chemistry terms (comprising about 500 terms in 100 pages of text) is now complete. This indicates the progress made on this second and very large project. Comments on the glossary are now being taken into consideration and a revised version will be available at the next meeting of the Commission. All IUPAC Committees and Commissions active in this area will be informed about this project.

In view of the problems connected with the analysis of workplace atmospheres and with the intricacies of the existing methodology for ambient monitoring, preparation of an inventory of the application of diffusion samplers has started. Based on this inventory, a project on the use of diffusion samplers for monitoring ambient air and workplace atmospheres will commence in 1987.

An inventory of existing measurement techniques for emissions of large sources will also be made. This aims at harmonization of analytical and sampling methods in this field.

J. Slanina

Biochemical nomenclature

The Joint IUPAC–IUB (International Union of Biochemistry) Commission on Biochemical Nomenclature (JCBN) met in Rehovot, Israel, 4–6 May 1986. The following topics were discussed at the meeting.

Glycoproteins. The document on glycoproteins and related compounds was under review according to IUPAC procedure. Having been approved for publication by IUB, and for publication as provisional recommendations by the Interdivisional Committee on Nomenclature and Symbols (IDCNS), it was published in *Eur. J. Biochem.*, Vol. 159, pp. 1–6 (1986).

Steroids. The revised recommendations on steroid nomenclature were in the process of review by the Commission on Nomenclature of Organic Chemistry (CNOC), and various comments had been received.

Tetrapyrroles. Revised recommendations on tetrapyrroles were almost complete.

Prenols. Comments raised during review were presenting difficulties, as it appeared unlikely that biochemists would be willing to abandon the use of certain terms, such as "dimethylallyl" for "3,3-dimethylallyl", and "isopentenyl", which are well established in the biochemical literature but unacceptable in organic chemistry. It was agreed that a form of wording would be sought that would not prohibit the use of such terms in biochemical work while making it clear that they do not satisfy the rules of organic nomenclature.

Folic acid. Comments received during review could be satisfied and it would soon be possible to apply for final approval.

Amino acids and peptides. Various queries were discussed, of which the most substantial referred to the place to begin the name of a cyclic peptide (for which it was pointed out that *Chemical Abstracts* uses an alphabetical system), and the way to indicate the location of a disulphide bridge. Although the importance of the latter query was recognized, no conclusion was reached about which of several possible systems was to be preferred.

Newsletter. A newsletter describing the work of JCBN appeared in *CI* Vol. 8, No. 4, pp. 30–31 (1986). This was a short version of the newsletter published jointly with the Nomenclature Committee of IUB, which appeared in *Eur. J. Biochem.*, Vol. 154, pp. 485–487 (1986] and in other biochemical journals. A newsletter was planned for 1987 (but after the meeting it was decided that there was insufficient new material to justify proceeding with this).

Nomenclature Committee of IUB. JCN contributed to the discussion of various IUB matters. Among these, the preparation of revised recommendations on electron-transfer proteins was likely to be of importance to inorganic chemists, and it was agreed that the Commission on Nomenclature of Inorganic Chemistry (CNIC) would be informed and consulted about these recommendations.

Athel Cornish-Bowden

Towards harmonization

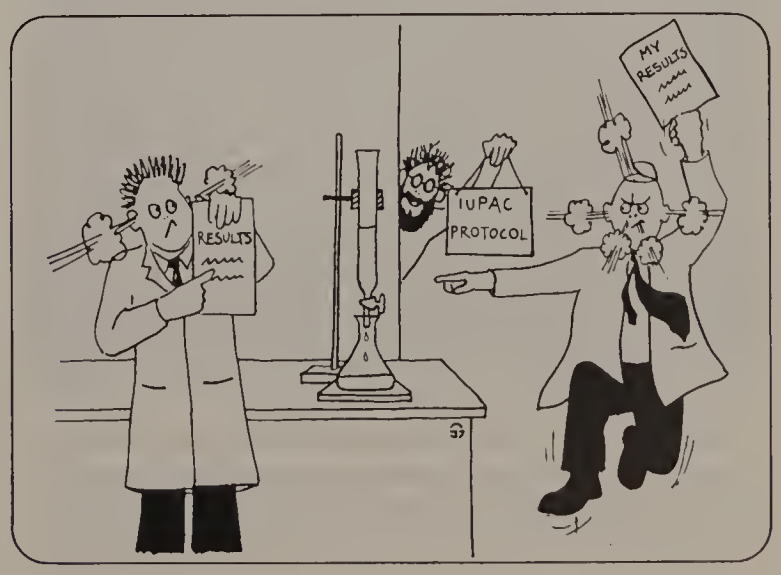
An IUPAC Working Party is currently putting the finishing touches to a harmonized protocol for the design, conduct and interpretation of collaborative analytical studies. The protocol will be presented at the 34th IUPAC General Assembly in Boston.

The need for harmonization

Do you or your organization get into arguments about the results obtained by analysis or testing? In contractual situations, are there arguments between suppliers and purchasers? Have you ever had to subject your results to litigation or arbitration to decide: who was right? Are the test methods used in your laboratory giving reliable and consistent results? How do the results from your laboratory compare with results from elsewhere? If a new analytical method is developed, how do you decide how good it is?

Organizations and individuals throughout the world, who use or generate results concerning environmental, regulatory, economic, health, safety, commercial and contractual matters need to carefully consider the above questions. Many scientific and technical organizations have approved standards and test methods for particular commodities — foods, drugs, fertilizers, coal, rubber, etc. These test methods, which are used to determine compliance with standards must be shown to be satisfactory for their intended purposes. This is usually demonstrated by sending a set of identical representative samples to a group of typical laboratories, which will use the method and report their results. These are then collated and evaluated, using statistical techniques, and finally conclusions are drawn.

Though most of the organizations follow such a pattern of collaborative testing, each of them has developed its own rules for the conduct of the study — how many laboratories should participate, how many materials should be analysed, how close together the results should be, and so on. Since many organizations have similar and sometimes overlapping interests, a great deal of duplication of work happens all the time. Obviously, there is a need for harmonization — this is what the IUPAC Working Party on the Harmonization of Collaborative Analytical Studies is trying to achieve.



In order to permit a single study on a single commodity to serve as a basis for approval by all organizations having an interest in that area, an effort is being made to develop a harmonized protocol for the design, conduct and interpretation of collaborative analytical studies, acceptable to all participating organizations. When a method or a standard is demonstrated as satisfactory by this common set of directives, that method or standard can then be adopted by other organizations without the necessity of repeating the study.

The first steps

The first steps towards such harmonization were taken in the early 1980s by the late Dr Harold Egan, then HM Government Chemist in London. After thorough groundwork, which involved contacting more than thirty international organizations, the first Harmonization Symposium was held in Helsinki in August 1982. Twenty-five international bodies participated, explaining their own ways of running collaborative studies. A full session was devoted to discussion. Although the delegates could agree on a number of significant issues and principles, so many differences prevailed that it was considered best to have another symposium before further action could be taken.

Dr Egan began the organizational work immediately after his return from Helsinki, but his untimely death in 1984 did not allow him to see the fruits of those efforts. Dr Bill Horwitz (US Food and Drug Administration) took over the burden of organization and, mainly as a result of his hard work, the successful second Harmonization Symposium took place in the premises of the US National Academy of Sciences, Washington DC in October 1984.

More or less the same participants gathered there again, and expressed revised thoughts, new ideas and a willingness to further harmonization. There were still differences in views and philosophies, notably between the Association of Official Analytical Chemists (AOAC) and the International Standards Organization (ISO), but the delegates nevertheless felt that the time was ripe to draft a final protocol. These findings were reported to the 33rd IUPAC General Assembly in 1985 in Lyon.

The working party

Having realized the importance of harmonization, IUPAC set up a Working Party at Lyon, with the immediate task of organizing a Workshop where the final protocol could be drafted. The WP is headed by Prof. Fernard Pellerin, former President of IUPAC's Division of Analytical Chemistry. Dr William Horwitz (from the Division's Commission on Analytical Nomenclature (V.3), also representing the views of AOAC) is in charge of drafting the protocol, with active assistance from Dr Michael Parkany (Commission V.3, representing the views of ISO). The three IUPAC Divisions, which are involved (Analytical, Applied and Clinical) are represented by Prof. Gerrit den Boef, Dr Lewis Coles and Dr Stanley Brown, respectively, while Dr Gyula Svehla (formerly Chairman of Commission V.3) acts as secretary.

Working Party on the Harmonization of Collaborative Analytical Studies meeting at the Royal Society, London in December 1986. From Left: Dr G. Svehla, Prof. G. den Boef and Dr M. Parkany.

The WP have had two meetings since Lyon: one in July 1986 in Bristol, and another in London in December of that year. By this time the protocol had almost been finished. It consists of more than 200 pages of text, with twelve specific recommendations, which will be discussed point by point at the Geneva Workshop. The latter will be held on 4–5 May 1987, and will be hosted by ISO. Participation will be by invitation. It is hoped that the protocol can be finalized there which, in turn, will be presented both to an ISO meeting in Grenoble later in May, and to the 34th IUPAC General Assembly in Boston in September. The final protocol will be then published as an IUPAC recommendation. It is hoped that from then onwards its recommended procedures will be used generally, and not only by the organizations which participated in drafting it. Simultaneously, ISO will revise and publish the new standard ISO 5725, taking into consideration this final protocol.

The way forward

Future plans of the WP include the harmonization of other types of interlaboratory tests, just as in the past, in close collaboration with ISO and AOAC. This will follow the pattern used when harmonizing collaborative studies; one or perhaps two symposia will be organized, then a final protocol will be drafted and, after circulation, it will be finalized at another workshop. Details of these activities will be reported later in *CI*.

Occupational hazards present risk to future generations

Worldwide industrialization has caused an increase in the number of chemical, physical and biological agents to which humans are exposed. One by-product of industrial development is the mounting concern that exposures to certain toxic substances may harm present or future generations. The large number of agents in use and the lack of knowledge about their effects on reproductive functions is of universal concern.

Up to now, studies carried out on the health hazards of chemical and biological agents existing in the work environment have concentrated mainly on the toxicity of such agents. Recently, however, following studies on animals, alarm bells have been ringing resulting in investigations into the effects on the human reproductive system of exposure to occupational hazards.

Last year the World Health Organization (WHO) convened a meeting of experts[1] to review present knowledge concerning effects on human reproduction of some of the most important industrial chemicals and to draw up guidelines for practice in the workplace, including tests for the monitoring of changes in the reproductive functions of workers exposed to occupational hazards as well as control measures to limit such exposure. The growing number of women in the workforce has focused attention particularly on the risks to pregnant women and their offspring. This concern has progressed to include factors that influence fertility and impaired reproduction in men.

The inability of a couple to conceive is a significant public health problem. Between 10% and 20% of all couples fail to conceive after one year of regular, unprotected intercourse. Few clinical studies, however, have examined the role of environmental or occupational factors in infertility and, until recently, study of the reproductive effects has focused rather on the outcome of pregnancy.

It has been shown that maternal or paternal exposure to a chemical or physical agent prior to conception may act upon either the male or female germ cells, so that fertilization of an ovum does not take place or abnormalities occur causing spontaneous abortion, stillbirth or live birth with defects. There is also evidence that occupational exposure of parents is related to the development of cancer in their offspring before the age of 15. Embryonic tissues of the foetus are more susceptible to certain carcinogens than those of the adult. Therefore, a brief or acute exposure during a critical period of growth may be sufficient to produce an adverse effect.

Studies show that in many cases of death due to childhood cancer, the father was employed in a petrol-related occupation, whilst maternal occupational exposure to chemicals (paint, petroleum products) during pregnancy was associated significantly with leukaemia.

Ionizing radiation

The genetic effects of ionizing radiation have been known for many years. It has been recommended that occupational exposure to radiation should not exceed 50 millisieverts (mSv) per year,[2] and that the total exposure of women during pregnancy should not exceed one tenth of that. The major groups of workers exposed to radiation are those associated with medicine — physicians, radiologists, nurses and assistants, especially those involved in radiation therapy and nuclear medicine.

Hazardous occupations

- *Agricultural workers*. Increased impotence has been found amongst men working with pesticides and herbicides.
- *Anaesthetists*. Female anaesthetists and operating-theatre personnel have higher abortion rates than expected. Another study showed a two-fold increase in spontaneous abortions and congenital malformations in exposed females and a 25% increase in congenital malformations in the offspring of exposed males. Some anaesthetics are also structurally related to vinyl chloride, a proven human carcinogen.

Without adequate ventilation and protective devices, laboratory workers may be exposed to many potentially embryotoxic chemicals, such as solvents, heavy metals, and carcinogens.

[1]WHO meeting on Review of Effects of Occupational Health Hazards on Reproductive Functions, 4–8 August 1986, under the chairmanship of Dr K. Hemminki, Institute of Occupational Health, Helsinki, Finland.

[2]The sievert (Sv) is a unit of dose which expresses radiation burden of human tissue. An average dose from exposure to background radiation, such as natural radioactivity, cosmic rays, fall-out from past nuclear testing, etc. is about 2 millisieverts (mSv) per year.

- *Smelters*. There were significant reductions in birth weight in the offspring of female smelter employees. Smelting materials have a high arsenic content and include other potentially toxic substances such as lead and sulphur dioxide. Genetic damage in otherwise healthy male smelters was found, raising the possibility of mutagenic effects being transmitted to the offspring.
- *Laboratory workers* may be exposed to many potentially embryotoxic chemicals, such as solvents, heavy metals, and carcinogens. An increased rate of spontaneous abortions has been found among women employed in chemical laboratories in the pharmaceutical industry compared with women employed in non-chemical laboratories.
- Other occupations where an increased risk of pregnancy complications has been found include *chemical workers* (particularly those working in plastics, styrene, viscose, rayon), painters and laundry workers (because of their exposure to solvents), metal workers (particularly electronics), forestry and fishing, industrial and construction workers. The WHO working group found that a good deal of research is required to substantiate the findings under review.

Guidelines for control measures

Control measures concerning the effects on reproduction of exposure to occupational hazards in the workplace are essential for the protection of both male and female workers. It is important to continually monitor levels of exposure to chemicals, physical and infectious agents in the workplace and, where necessary, adapt or modify the workload. In cases where the effects on reproduction are highly hazardous, the operations should be totally enclosed so that there is no exposure of the workers.

Pre-employment health examination should provide basic health data on workers and periodic check-ups should include tests for changes in reproductive functions. Such tests would include blood tests for chromosomal abnormalities, contents of sex hormones, etc.

Workers should be informed of possible effects on production of occupational hazards and taught work procedures that would help prevent such effects. Early symptoms of ill-health should be easily recognizable by the worker so that he or she can seek the necessary medical care. The WHO group also recommended development of a register of reproductive abnormalities together with data concerning occupational history and other variable such as drug and tobacco consumption.

Future generations

The health of future generations cannot be secured by excluding men or women from hazardous jobs but by improving working conditions. The ultimate goal has to be a safe workplace for all. Measures such as replacement of the hazardous agents, changes in technology, enclosing of certain processes, improved ventilation and design, personal protective devices, are available to achieve this goal.

Publications

Trivial names

Trivial names are often the joy of the specialist and the bane of most other users. Yet, paradoxically, in the absence of trivial names, verbal communication of complex structural information between chemists becomes almost impossible. Part of this paradox arises from the nature of trivial names and the range of categories they cover. There are at least five types of trivial names which fall into a series which often reflects the history of importance of a substance. Dr Friedo Giese of the Beilstein Institute has made a valiant attempt in a recent book (*Beilstein's Index, Trivial Names in Systematic Nomenclature of Organic Chemistry*)* to list the trivial names used by Beilstein, Chemical Abstracts and IUPAC.

In the evolution of a new significant trivial name it would historically start as the name of a substance considered to be pure, assumed to be different from other known compounds, but whose structure was entirely unknown. Most of the trivial names which are widely used today arose in this way but with the advent of modern spectroscopic methods it is rare in organic chemistry that such a name is proposed. However with very complex substances a trivial name may be invented with only partial structural information. This is almost the rule in some areas such as enzyme chemistry.

In the second stage of evolution the full structure of the trivially named compound is known. True trivial names, that is, names which convey no structural information, are rare. Although it now represents a unique substance and needs no qualification the structural information is often reflected in a modified suffix, for example rhodopinol (-ol showing the presence of an alcohol). Perhaps strictly these modified names should only be called semi-trivial. New semi-trivial names are still frequently generated for each new natural product characterized, even when easily related to

**Beilstein's Index: Trivial Names in Systematic Nomenclature of Organic Chemistry*, by F. Giese, published by Springer-Verlag, Berlin (1986). xiii +253 pp. ISBN 3–540–16142–2. Price DM 38–.

well-known compounds. It is inherent in a trivial name that it is not clear how much is known about stereochemistry. All or some of the relative stereochemistry may be known, and the absolute stereochemistry may or may not be known. Optical activity may be used to indicate chirality, for example (+)-citronellol, but that is no proof that the absolute stereochemistry is known ((+)-citronellol is in fact (*R*)).

The third stage of trivial name evolution occurs when it is recognized that several substances are related by a common skeletal feature. By renaming them using a common parent the interrelationship is highlighted. This parent is usually based on the stem of the name of the first discovered or identified member of the group with the suffix -ane (for a saturated system) etc. For example cholestane corresponds to the hydrocarbon from cholesterol (that is minus its double bond and alcohol group). It is typical that in this case cholestane also implies the absolute stereochemistry at seven of the eight chiral centres (by convention the stereochemistry at C-5 is always specified).

The example given in the third stage is really more appropriate for stage four, that is, trivial names used widely as the parent of that skeletal unit. A better example for stage three would be the rare alkaloid parent cycloanan. The difference between stage three and four reflects in part the interest in the field, the number of examples, and in part the ease of modification. Semi-trivial parents which retain functional groups such as an alcohol, or isolated double bonds are less readily modified. Stage four trivial names can be used extensively in a systematic way and are thus sometimes called semi-systematic names.

The fifth category of trivial names are those used specifically for the name of a substituent in systematic nomenclature as a prefix. Semi-systematic names can be converted into a prefix form by means of the suffix -yl (or -ylidene etc.) but there are a few used in a prefix form only, for example phenyl.

Giese includes in his book some examples of type two and many of types three and four. The criterion for inclusion is not clear, but I suspect it is primarily Beilstein usage. Some, but not all, IUPAC and *Chemical Abstracts* trivial names are included and in general the differences between the three organizations are indicated. Usualy a Beilstein reference is given, the CAS-Registry Number and an IUPAC reference. Some synonyms and trivial names of closely related compounds are quoted. Where there are stereoisomers then these are usually given.

All names are in both German and English with cross references if widely separated alphabetically. Basically entries are in English name order (except for phenethyl alcohol, which is located as if spelled in German, that is phenäthylalkohol). Since, apart from names, the entries use the universal language of graphic formulae it is only the introductory text, and a section on root-modifying prefixes (for example nor-), which are published both in English and German. There are few errors. One noted was the transposition of the formulae for norbornane and norpinane. However in several places stereochemistry is missing for example C-11 of ormosanine, or more confusingly there is no comment on differences between the three groups, for example eudesmane is shown with a 4β-methyl as used by Beilstein but it is 4α-methyl in *Chemical Abstracts* and IUPAC.

The source of IUPAC information is given in an appendix and reveals several deficiencies. Perhaps most surprising is the use of the 1969 edition of *Nomenclature of Organic Chemistry* which only covered sections A, B and C. The 1979 edition which covered sections A, B, C, D, E, F and H is not mentioned although section F (natural products) is separately mentioned in its 1976 version. Similarly the IUPAC–IUB Commission on Biochemical Nomenclature (predecessor of JCBN) documents on carotenoids and nucleic acid are only mentioned in their provisional forms. Their recommendations on corrinoids, branched monosaccharides and unsaturated monosaccharides are not mentioned.

Giese must have had trouble selecting IUPAC-recommended trivial names. In the Blue Book (*Nomenclature of Organic Chemistry, sections A, B, C, D, E, F and H,* 1979) there are many lists headed by "The following are examples of trivial names which are retained": In the revision of the Blue Book currently in progress by CNOC it is intended to remove this ambiguity by providing a limited list for systematic organic nomenclature. In the revision of section F which is also in progress, it is intended to list the main natural product parents. In his book Giese indicates most natural product parents mentioned in IUPAC documents. However many others appear with the IUPAC reference F-2. Presumably this is intended to indicate the compound conforms to the recommendations for selecting semi-systematic names. Although most examples are appropriate parents, others retain an isolated double bond which is not recommended. It is not clear why some examples explicitly given in section F are only indicated by the general reference F-2.

Like all nomenclature the evolution of new names is in part balanced by the extinction of obsolete names. This is well illustrated by the carboxylic acids. Caproic, caprylic and capric acid were abandoned many years ago by IUPAC. They are included in the book with just a mention of their systematic names. However valeric, butyric and propionic acid are currently recommended by

IUPAC and used by Beilstein but the systematic or semi-systematic names (for example propanoic (not trianoic)) are used by *Chemical Abstracts*. In the next edition of the Blue Book it is probable that IUPAC will recommend systematic names.

In conclusion Giese has prepared a most useful compilation of trivial names used by Beilstein. Most IUPAC recommended names are included but there are some surprising omissions such as toluidine and pyrrolizine. Many semi-systematic names used by *Chemical Abstracts* are omitted. It is a most useful reference work which in a more comprehensive second edition could be invaluable.

G. P. Moss

Sulfites, Selenites and Tellurites

Volume 26 of the *Solubility Data Series* deals with the solubilities of the sulfites, selenites and tellurites of the alkali metals and ammonium, the alkaline-earth metals, and manganese, iron, cobalt, nickel, copper, silver, zinc, cadmium, mercury and lead. Solubility data for binary systems and for all types of multicomponent systems are included. In all systems, one of the solvent components is water; therefore in the few cases where solubilities in other solvents are given, the systems are treated as aqueous multicomponent systems.

According to the fully systematic IUPAC nomenclature, sulfite is sulfate(IV) [or strictly trioxosulfate(IV)], pyrosulfite is disulfate(IV) (2−) or disulfite, selenite is selenate(IV), tellurite is tellurate(IV), etc. The systematic names have not been used in the text, because the trivial names are well-established ones, and are less likely to be misunderstood. Some of these trivial names are IUPAC "accepted names", but others, such as tellurite, are not.

The literature has been covered up to 1984. The solubilities of hydrated compounds are always given in terms of the unhydrated components. When solubility data in the literature were expressed in units of mass % (%w/w in the older literature) or related quantities, or when amount-of-substance concentrations were reported together with the densities of the solutions, conversions to molality (units — mol kg^{-1}) were made by the compilers/evaluators, with use of IUPAC-recommended atomic masses. In many of the compilation sheets, the molalities have been calculated by computer, and expressed in a uniform format with three figures after the decimal point. This sometimes has resulted in the appearance of too many significant figures. In the evaluations, the correct number of significant figures is always given.

Phase diagrams are presented for as many as possible of the ternary systems, and also for some quaternary ones. Many of these were plotted by computer from the original data, irrespective of whether or not figures were provided in the original papers.

For "soluble systems", most of the solubility data are expressed in units of mass %, and conversions have been made as stated above. For "sparingly soluble systems", analyses are usually reported as amount-of-substance concentrations, and the actual solubilities are expressed as solubility products, or in terms of other forms of equilibrium constants.

The solubility products quoted are usually analytical "concentration solubility products". Otherwise, definitions like "activity solubility product" or "solubility product based on the activities" or "concentration solubility product, corrected for hydrolysis effects" are given. Only rarely have "thermodynamic" constants been obtained, and usually conditions were insufficiently well defined to allow calculation of thermodynamic constants from the corresponding concentration constants by making activity corrections.

The book is edited by M. R. Masson, H. D. Lutz and B. Engelen and published by Pergamon Press, Oxford, UK, 1986, xxiii + 451 pp. ISBN 0 08 032517 3. Price US-$100.00, £64.00.

Gene Technology for Medical Chemists: A Glossary

The Provisional Section Committee on Medicinal Chemistry has drafted a glossary of terms in gene technology for use by medicinal chemists. The glossary is intended primarily to help non-experts to follow and to understand lectures and publications.

Copies of the glossary are available from:

Professor J. Engels,
Institut für Organische Chemie,
Johann-Wolfgang-Goethe-Universität
Frankfurt,
Niederurseler Hang,
D-6000 Frankfurt/Main 50,
Federal Republic of Germany

to whom comments on the glossary should be addressed.

This glossary may eventually be incorporated into a compendium of terminology on biotechnology by IUPAC.

Exploration, mining and processing of materials

Analytical chemistry is vital to the mining and minerals industry. To meet the ever-increasing demands in the quest for better quality and the most economical exploitation of mineral resources,

sophisticated analytical techniques must be developed constantly or existing methods improved.

Analytical Chemistry in the Exploration, Mining and Processing of Materials contains invited lectures presented at the 2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials which was held in South Africa in April 1985, under the aegis of the IUPAC Analytical Chemistry Division and the Council for Scientific and Industrial Research. The aim of the symposium was to highlight the importance of analytical chemistry in the production of materials, from the initial stages of exploration and assessment of ores to their beneficiation, and, finally, to the refined product. Themes highlighted at the symposium include:

- Atomic absorption spectrometry techniques
- Inductively coupled plasmas
- X-ray fluorescence and diffraction techniques
- Neutron activation techniques
- Ion beam analysis
- Surface analytical techniques
- Geochemical exploration
- Automation and on-line analysis
- Flow injection analysis
- Chemometrics
- Analysis of ferrous and non-ferrous materials
- Wet chemistry
- Reference materials
- Elemental analysis of coal
- Analysis of ceramic materials
- Analysis of active source materials
- Analysis of gold, silver and platinum group material

This volume will be of interest to anyone working in fields related to the quality of materials, such as analytical chemists, mineral physicists, metallurgists, geologists, and chemical and mining engineers.

The book is edited by L. P. R. Butler and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1986. vii + 254 pp. ISBN 0 632 01532 2. Price £22.50/US-$30.00.

Thermodynamic Data for Biochemistry and Biotechnology

Workers in biochemistry and biophysics frequently have need for thermodynamic data relating to molecules, both small and large, and to the equilibrium properties of systems involving such molecules. Knowledge of the partial specific or molar volumes, heat capacities, and compressibilities of molecules of biological interest is frequently important, both in the planning of experiments and in understanding molecular interactions. The characterization of reversible conformational transitions, in nucleic acids, proteins, and other molecules, is a central problem today, whether those transitions are associated with ligand binding, with temperature or pressure changes, or with various other conditions. Thermodynamics is often relevant to kinetic studies, as in many, perhaps most, enzyme-catalysed reactions, for which certain intermediate steps in the total process may be essentially at equilibrium at any moment. The special thermodynamic properties of water and aqueous solutions, as they relate to ions, and to polar and non-polar molecules, are naturally of supreme importance in biology.

A vast amount of information is now available in the scientific literature relating to these and other thermodynamic properties of systems of biochemical interest. The investigator who needs such data for current work often has difficulty in finding the particular information that is needed, or in judging which of the reported values are the most trustworthy. it is the aim of *Thermodynamic Data for Biochemistry and Biotechnology* to present selected and critically evaluated data for many of the important fields of research in biochemistry and biophysics. Those who have compiled and evaluated the data in this book are all experts in their respective fields, and their labours should save other workers much time and trouble by guiding them to the best available data.

This book represents one important product of the work of the now defunct Interunion Commission on Biothermodynamics, supported by IUPAC, the International Union of Biochemistry (IUB) and the International Union of Pure and Applied Biophysics (IUPAB).

The book is edited by Hans-Jurgen Hinz and published by Springer-Verlag, Berlin, Heidelberg, FRG, 1986. vi + 456 pp. ISBN 3 540 16368 9/ 0 387 16368 9. Price DM 298.00.

Romanian translations

Nomenclature of Organic Chemistry (the Blue Book) has been translated and adapted into Romanian by D. Purdela and published in 1986 by Editura Academiei, Bucharest. The translation (450 pp.) was supervised and prefaced by Prof. Alexandru T. Balaban who is National Representative of Romania on the Commission on Nomenclature of Organic Chemistry (CNOC) and President of the Academy of Romania's Commission on Chemical Nomenclature.

Balaban has also supervised and prefaced other translations and adaptations of IUPAC Nomenclature Rules into Romanian: *Nomenclature of Inorganic Chemistry* (D. Purdela, 153 pp., 1977) and *Nomenclature of Biochemistry* (I. F. Dumitru, 295 pp., 1984). Both were published by Editura Academiei.

These hard cover Romanian books preserve the cover colours of the original editions: red for inorganic chemistry and blue for organic chemistry.

Romanian is a phonetically-written Romance language derived from Latin and thus closely related to Italian, Spanish and Portuguese. Chemists contributing to these editions had to face decisions concerning spelling, genders and plurals of chemical names. An example was the decision to consistently include the euphonic vowel "o" after prefixes such as chloro-, bromo- and cyano- as in English and Romance languages but unlike German and Russian.

Robert D. Freeman's article "New Standard-State Pressure for Thermodynamic Data" which appeared in *International Newsletter on Chemical Education* (No. 21, pp. 2–4, June 1984) has also been translated into Romanian. The Romanian text, which was approved by the Academia Republicii Socialiste România, was published in *Revista de Chimie*, Vol. 37, No. 8, p. 631 (1986).

Ring-opening polymerization

Ring-opening polymerization of cyclic monomers has developed considerably over the last decade. A large number of new polymerization processes have been proposed and new polymers described. In addition, many familiar polymers have been improved through modification of their techniques of fabrication or through the implementation of new techniques.

Volume 6 of *Makromol. Chem., Macromol. Symp.* (1986) contains the main lectures presented by 14 leading scientists in macromolecular chemistry from nine countries at the 5th International Symposium on Ring-opening Polymerization (ROP 86), held in Blois, France, 22–26 June 1986. The volume also contains 13 communications based on papers contributed at the symposium.

The contents of this volume may be divided into four main topics:

- Polymerization of heterocycles and cycloolefins: kinetics and mechanisms
- New polymers: tailor-made polymers and copolymers
- Industrial polymers. Biomedical polymers and pharmaceutical materials: syntheses and applications
- Structure and physical properties of the polymers

Carbon dioxide and other greenhouse gases

The increase of carbon dioxide in the atmosphere has long been recognized as a potential problem. International scientific organizations have sponsored many meetings on the CO_2 issue over the years but the first joint UNEP/ISCU/WMO* assessment of CO_2 was held in Villach, Austria in September 1980. In October 1982, these three organizations met in Geneva and recommended that assessments of the CO_2 issue be held every five years, starting from that first meeting in 1980. (An interim assessment was held in September 1982, which essentially confirmed the conclusions of the 1980 meeting but determined that the range of uncertainties was greater in 1982 than in 1980.)

WMO Report 661 contains the conclusions and recommendations of the second joint UNEP/ISCU/WMO International Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts, held in Villach, Austria, 9–15 October 1985. The conclusions of the international scientists who attended the conference about climate changes in the next century are very striking indeed and are of great importance to humankind. Their recommendations for future actions bear close attention by national decision-makers to ensure that this crucial issue of the potential impact of greenhouse gases on climate in the next century is properly considered and that appropriate actions are initiated soon.

The report (WMO 661) is published by the World Meteorological Organization, 1986, ISBN 92 63 10661 4. The address of WMO is 41, Avenue Giuseppe Motta, Case postale No. 5, 1211 Geneva 20, Switzerland. Tel. (41 22) 34 64 00. Telex 23260 OMM CH.

World Food Report 1986

Each year the *World Food Report* provides an up-to-date briefing on the world food and agriculture situation and reviews the work of the Food and Agriculture Organization (FAO) of the United Nations during the previous year. It also includes general background information on current topics of interest in food and agricultural development. The report is based on data available as of 31 January in the year of publication.

The report is intended primarily for use by the media, non-governmental organizations and all individuals responsible for mobilizing support for agricultural and rural development. It is not a technical document. Readers requiring detailed technical data should refer to publications such as the *State of Food and Agriculture* and the various statistical periodicals and yearbooks issued by FAO.

For information on FAO publications and sales agents, please write to Distribution and Sales Section, FAO, Via delle Terme di Caracalla, 00100 Rome, Italy.

*UNEP: United Nations Environment Programme
ICSU: International Council of Scientific Unions
WMO: World Meteorological Organization

A maturing partnership

ICSU–UNESCO: Forty Years of Cooperation by ICSU Executive Secretary F. W. G. Baker and published by the ICSU Secretariat in November 1986 outlines "the maturing partnership" over 40 years between the International Council of Scientific Unions (ICSU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO).

The booklet reviews some of the larger projects resulting from this cooperation and includes chapters on: Studies of the Biosphere; Studies of the Geosphere; Marine Sciences; Science and Technology in Developing Countries, and Science Education and Training.

Pharmaceutical substances

Basic Tests for Pharmaceutical Substances presents simplified tests for verifying the identity of pharmaceutical substances and detecting gross degradation. The 321 substances covered represent the majority of drug substances contained in the WHO model list of essential drugs* as well as a number of widely used drug substances. For each, tests have been devised to serve as a simple and readily applicable method of verification of identity when a fully equipped laboratory is not available. For this reason, the required reagents and equipment have been kept to a minimum, and reagents that are unstable, corrosive, expensive, or difficult to obtain have been excluded.

Special attention has been given to the techniques used to determine melting characteristics, as these provide a basis not only for confirming the identity of a substance but also for detecting possible contamination, whether arising from poor manufacture, adulteration, cross-contamination during storage, or degradation.

The book concludes with a list of required equipment and a description of the reagents, test solutions and volumetric solutions mentioned in the basic tests. The procedures for the preparation of test solutions that require special attention are given in detail. The book will serve as a useful component of the WHO programme for quality assurance in the pharmaceutical supply system.

The book is published by WHO (World Health Organization), 1986. vi + 204 pp. ISBN 92 4 154204 7. Price Sw.fr. 34.–/US-$17.00. Arabic, French and Spanish versions are in preparation.

*The Use of Essential Drugs (Model List of Essential Drugs, Fourth List). Second report of the WHO Expert Committee (Geneva, 1984). *Technical Report Series* No. 722, 1985, 50 pp. ISBN 92 4 120722 1, Sw.fr. 6.–/US–$3.00. Available in English, French and Spanish. Arabic version is in preparation.

RFEM radiation

The National Council on Radiation Protection and Measurements (NCRP) has published NCRP Report No. 86, *Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields.* This report is the second of a series concerning radiofrequency electromagnetic (RFEM) radiation that constitutes an extension of the NCRP interest into the subject of non-ionizing radiation. The first report, NCRP Report No. 67, *Radiofrequency Electromagnetic Fields — Properties, Quantities and Units, Biophysical Interaction, and Measurements*, was published in 1981. The report provided a comprehensive discussion of fundamentals, especially those that relate to radiation protection. It provided the basis for future reports, including this one.

Soon after the work on Report No. 67 was begun, the NCRP formed Scientific Committee 53 to prepare a report on the biological effects of RFEM radiation. This scientific committee was also requested to consider the development of recommendations for exposure criteria if the committee felt that such recommendations could be justified on the basis of the adequacy of the biological information. The scientific literature on the biological effects of RFEM radiation is voluminous but of varying scientific quality, and it has taken considerable time to assess it. On the basis of a detailed evaluation, which is reflected in this report, the committee concluded that exposure criteria could be developed in spite of the limitations of the biological information and these are included in this document.

It needs to be recognized that our understanding of the biological effects of RFEM radiation is still evolving, based on continuing research on this important subject. As a result, it is to be expected that the exposure criteria set out in this report will be evaluated periodically in the future, and possibly revised as new information becomes available. This is a continuing challenge for those involved in radiation protection and one to which the NCRP expects to respond.

NCRP Report No. 67 was published in 1986, ISBN 0 913392 80 4. NCRP publications are distributed by the NCRP Publications office. Information on prices and how to order may be obtained by directing an enquiry to: NCRP Publications, 7910 Woodmont Avenue, Suite 1016, Bethesda, MD 20814, USA.

Thermal conductivity of liquids

Work carried out under the auspices of the Sub-Committee on Transport Properties of Commission I.2 has been published in a paper entitled "Standard reference data for the thermal conductivity of liquids" (*J. Phys. Chem. Ref. Data*, Vol. 15, No. 3, p. 1073, 1986).

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Mineral solubilities

Solubilities of minerals in supercritical H_2O and H_2O–CO_2 mixtures are of prime importance to our understanding of mineral transformations, fluid-flow and fluid–rock interactions in the earth's crust. A paper entitled "Mineral solubilities in supercritical H_2O solutions" presented by John V. Walther (USA) at the 2nd International Symposium on Solubility Phenomena held in Newark, New Jersey, USA, 12–15 August 1986, reviews available data on mineral solubility and speciation in aqueous fluids at elevated temperatures and pressures and with variable activities of Cl^- and CO_2.

As is to be expected from the decrease in the dielectric constant of the fluid, neutral or lower charged complexes become increasingly abundant as temperature and pressure are increased to supercritical conditions. Alkali and alkaline earth elements in aqueous solution exist primarily in chloride complexes because chloride is the most abundant complexing anion in crustal solutions. Neutral complexes that are unknown or significant only in alkaline solution at 25°C become important in near-neutral solutions at elevated temperatures and pressures. Of particular interest are sodium and potassium alumina and sodium and potassium silica complexes which are apparently quite stable at temperatures above 400°C and 1 kbar.

Hydroxyls complex with cation species to an increasing degree in near-neutral solutions as temperature is increased. The ability of a cation to complex hydroxyls is controlled to a large extent by its surface change density. The higher the charge density the greater is the degree of hydrolysis to form lower charged or neutral complexes. Surface charge density also affects the degree of chloride complexation of cations. It can be shown that the greater the surface charge density the greater the temperature dependence of the chloride electrolyte dissociation.

Walther's paper was published in the December issue of *PAC*, Vol. 58, No. 12, pp. 1585–1598 (1986). This issue also contains invited lectures presented at the 29th Microsymposium on Macromolecules: "Synthetic Polymeric Membranes' held in Prague, Czechoslavakia, 7–10 July 1986. The papers include "Recent trends in ion exchange membrane research" by Toshhikatsu Sata (Japan); "The use of electric current for enhancing the efficiency of pressure-driven membrane processes" by Yu. I. Dytnerskii (USSR) and "Transport phenomena in ultrafiltration: membrane selectivity and boundary layer phenomena" by Gunnar Jonsson (Denmark).

Phase equilibria of minerals

Phase diagrams provide the basis for understanding the distribution and state of earth materials according to O. L. Kuskov (USSR). However, although the mineral composition and inner structure of the transition zone of the earth's mantle has often been examined in the literature, a detailed picture of phase equilibria at pressures over 100 kbar, both in the mantle and in silicate systems modelling its composition, has not yet been clearly outlined.

The reason lies in the difficulties of conducting experimental studies at the p–T parameters of the transition zone which increase greatly with the number of phases. Thus, use of numerical computation techniques of chemical thermodynamics becomes indispensable, making it possible to generalize and match the available experimental data on simple systems and, based upon these, to derive phase diagrams of much more complex systems.

From a petrologic–geochemical point of view, the final aim of such an approach consists of plotting a p–T diagram of a multicomponent system and modelling the mineral composition of the mantle; from a geophysical point of view, the knowledge of equations of state of minerals and phase diagrams of an adequately common chemical composition enables us to predict seismic anomalies and to determine their intensity. Seismic discontinuities in the mantle can be connected not with just one individual transformation, but with their totality or even with the existence of invariant points in the phase diagrams.

Kuskov's paper "Thermodynamics of minerals of the mantle transition zone" was presented as an invited lecture at the 9th International Conference on Chemical Thermodynamics held in Lisbon, Portugal, 14–18 July 1986. Plenary and invited lectures from this conference were published in the January issue of *PAC*, Vol. 59, No. 1 (1987).

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

A collaborative study of the stability of extrusion, melt spinning and tubular film extrusion of some high-, low- and linear-low-density polyethylene samples

A comparative study by several industrial and academic laboratories of the shear and elongational rheological behaviour and unstable processing behaviour of a series of well-characterized linear and branched polythylene is reported. The processing operations investigated were flow through a die, melt spinning and tubular film extrusion. Broadening molecular weight distribution in the linear polyethylenes increased deviations from Newtonian flow, increased elastic memory and decreased filament stability in elongational flow. It also deteriorated melt spinning stability but broadened the range of stable operation in tubular film extrusion. Extrudate distortion occurred at the same critical die wall shear stress, but the characteristics of the unstable region were changed. Long-chain branched polyethylenes exhibited generally enhanced elastic memory, greater stability and deformation rate hardening in uniaxial extension. Melt spinning and tubular film extrusion characteristics were stabilized relative to linear polyethylenes, but extrudate distortion first occurred at a lower shear stress. The unstable extrusion characteristics were quite different from the linear polyethylenes. The linear low-density polyethylene investigated generally responded similarly to a linear polyethylene of about the same molecular weight distribution.

This report was prepared by the Commission on Polymer Characterization and Properties (IV.2) and published in PAC, *Vol. 59, No. 2, pp. 193–216 (1987).*

The onset of runaway creep in HIPS (high impact polystyrene): a study in variability

Previous IUPAC work has shown considerable unexplained variation in the time to the onset of runaway creep in HIPS. Further experiments in seven laboratories have clearly identified the effects of moulding and testing parameters. The chief and most significant effect is that of small variations of stress. A simple reason for this is proposed. By viewing the experiments differently it can be seen that the variation in results is in fact of a level that would normally cause little comment or concern.

This report was prepared by the Commission on Polymer Characterization and Properties (IV.2) and published in PAC, *Vol. 59, No. 2, pp. 217–220 (1987).*

Determination of aluminium in biological materials by graphite furnace atomic absorption spectrometry (GFAAS)

A survey is given over various methods for the determination of aluminium in biological materials. Graphite furnace atomic absorption spectrometry (GFAAS) is the most widely used technique since it is sufficiently sensitive and simple to operate. The limitations inherent in GFAAS procedures are critically discussed. Reported results for aluminium in blood, serum and tissues differ largely showing that the determination of this element is subjected to large errors due to contamination during sample handling.

This report was prepared by the Commission on Microchemical Techniques and Trace Analysis (V.2) and published in PAC, *Vol. 59, No. 2, pp. 221–228 (1987).*

Distribution analysis of major and trace elements through semiconductor layers of changing matrix using secondary ion mass spectrometry (SIMS)

Secondary ion mass spectrometry is often used to monitor elemental distributions in solids and at solid interfaces. The technique is highly sensitive for most elements and has good depth resolution. However, the complexity of the sputtering event has made quantitative analysis difficult, especially in multimatrix samples where changing matrix effects are encountered. Due to the increasing importance of multilayer–multimatrix samples in semiconductor device technology, matrix effect calibration for quantitative SIMS analyses in these samples is essential. In this article, the current status of quantitative SIMS analysis in layered multimatrix samples is presented. First, the basics of SIMS quantification and theories describing matrix effects are reviewed. Matrix effect calibra-

tion and depth profile corrections for Al_xGa_{1-x} as multilayers are then examined. Next, a method of extending these calibrations to the remaining IIIA-VA semiconductors is presented. Finally, future trends in matrix effect calibration and depth profile correction are discussed.

This report was prepared by the Commission on Microchemical Techniques and Trace Analysis (V.2) and published in PAC, *Vol. 59, No. 2, pp. 229–244 (1987).*

Electrochemical analysis of organic pollutants

The electroanalytical techniques of pulse polarography, stripping voltammetry and on-line electrochemical detection have been used for the identification and determination of trace concentrations of a wide variety of environmentally significant organic molecules, usually after the application of sample pretreatment procedures, certain separation techniques and, in some cases, derivatization. Classes of molecules that can be determined using these methodologies are carbonyls, simple aromatics such as nitroaromatics, phenols, polychlorinated aromatics, carboxylic acids, sulphonates, organophosphorus compounds, azomethines, thiols, carbamates and amines.

This report was prepared by the Commision on Electroanalytical Chemistry (V.5) and published in PAC, *Vol. 59, No. 2, pp. 245–256 (1987).*

Measurement of cellulase activities

The Fermentation Commission, IUPAC (changed to Commission on Biotechnology, IUPAC, July 1980) put in considerable effort and time since July 1976 to prepare a document prescribing standard assay procedures for cellulase enzyme system. The subject area was considered significantly important because the number of groups engaged in the studies of enzymatic breakdown of cellulose of various sources were on steady increase. At least nine Commission meetings held during the last several years (Berlin, July 1976; Warsaw, June 1977; Munich, September 1978; Davos, September 1979; London (Ontario), July 1980; Leuven, August 1981; MIT (Boston), August 1982; Lyngby, August 1983 and New Delhi, February 1984) gave considerable attention to this project. Several aspects of the proposed standard procedures available to workers for enzyme and substrate evaluation were considered. The detailed text of the draft prepared during mid-1980 and partially modified in early 1982 were discussed by the Commission at the MIT workshop in 1982. At the Lyngby meeting the Commission gave its final recommendations on the manuscript which after some additional review was adopted at the New Delhi meeting in February 1984 for release. Several procedures were suggested in the draft for consideration of the members of the Commission and other experts in the field. The final version of the Commission's draft is expected to be useful as a document of standard procedures for assay and evaluation of cellulase enzyme system.

Although for a subject area so complicated and involved like the assay procedures of various enzymes associated with the cellulose–cellulase system, it was expected that the concerned groups and individuals might find it difficult to agree on a common draft. However, the members of the Commission as well as others who collaborated in the preparation of the document felt the need for a working document to form the basis of exchange of ideas and comparison of results. With this in view the New Delhi meeting of the Commission finally approved the recommendations for circulation. Necessarily, the Commission will review the assay procedures as and when some new information is available.

This report was prepared by the Commission on Biotechnology (VI.2) and published in PAC, *Vol. 59, No. 2, pp. 257–268 (1987).*

Newsletters & Bulletins

International Council of Scientific Unions (ICSU)

ICSU Newsletter, No. 26, August 1986. This contains a report on decisions of the 45th meeting of the Executive Board and reports on the International Astronomical Union (IAU), International Geographic Union (IGU), Committee on Water Research (COWAR), Committee on Data for Science and Technology (CODATA) and the Committee on the Teaching of Science (CTS). There are also reports on science and technology for development, follow-up to the Ringberg Conference and biotechnology.

No. 27, October 1986 has a report on the 21st

ICSU General Assembly (see *CI*, Vol. 9, No. 2, p. 54 (1987)) including all the resolutions. There is also a report on decisions of the 46th and 47th meetings of the Executive Board and reports on the International Union of Crystallography (IUCr), CODATA, World Climate Research Programme (WCRP), Committee on Climatic Changes and the Ocean (CCO), International Bioscience Networks (IBN) and Science and technology for development.

No. 28, December 1986 includes a report on a meeting of National Representatives in Berne, Switzerland in September 1986 as well as reports on the International Union of Geodesy and Geophysics (IUGG), Scientific Committee on Oceanic Research (SCOR), Scientific Committee on Antarctic Research (SCAR), Committee on Genetic Experimentation (COGENE), International Federation for Information and Documentation (FID) and African Biosciences Network (ABN).

ICSU Committee on the Teaching of Science (CTS)

International Newsletter on Science Technician Training, No. 6, November 1986 includes articles on the training of science technicians in the National University of Lesotho, training for science laboratory instrumentation in developing countries, and training of science technicians in the chemical industries of FRG.

ICSU Committee on Space Research (COSPAR)

COSPAR Information Bulletin, No. 106/7, August/ December 1986 contains almost 200 pages of reports on COSPAR meetings, news from international and national institutions and organizations concerned with space research as well as a report on the International Satellite Land Surface Climatology Project, a survey of satellites and space probes and the International Geophysical Calendar for 1987.

ICSU Scientific Committee on Problems of the Environment (SCOPE)

SCOPE Newsletter, No. 26, September 1986 has items on genetically-designed organisms in the environment; chemical accidents (see *CI*, Vol. 9, No. 1, p. 35 (1987)); and news from SCOPE National Committees.

No. 27, November 1986 contains articles on phosphorus cycles in terrestrial and aquatic ecosystems; global carbon and nutrient cycling; the sulfur cycle in terrestrial and aquatic ecosystems and metals in coastal environments of Latin America.

ICSU Committee on Data for Science and Technology (CODATA)

CODATA Bulletin, No. 62, October 1986 is a report of the CODATA Task Group on Multisatellite Thematic Mapping. The first chapter is entitled "Geology and Mineralization in Tanzania" and includes two coloured maps.

CODATA Newsletter, No. 38, October 1986 has an article on "The inception, beginning, and first days of CODATA" and reports on CODATA activities by the National Committees and Unions including IUPAC.

ICSU Committee on Science and Technology in Developing Countries (COSTED)

Science, Technology and Development, Vol. 10, No. 3, Autumn 1986 is the latest issue of COSTED's quarterly journal and news bulletin. It includes a feature article on "Current patterns of energy consumption in a developing country. The Indian experience", several reports of conferences, workshops, symposia and seminars organized or supported by COSTED in the Asian Region and a report of activities by the East African COSTED office.

International Organization for Biotechnology and Bioengineering (IOBB)

Biotecnologia, December 1986, published in Guatemala, is the newsletter of IOBB — an Associated Organization (AO) of IUPAC. This issue contains an editorial on "The many faces of biotechnology" as well as information on the work of the IUPAC Commission on Biotechnology (VI.2) and ICSU's Scientific Committee on Biotechnology (COBIOTECH).

International Federation of Clinical Chemistry (IFCC)

IFCC News, No. 43, 1986/3. "Bigger scope and frequency for IFCC news" is the heading in this issue. Other items include "What are the essential tests?" and EP (Expert Panel) news on apolipoproteins. IFCC is an AO of IUPAC.

International Association for Cereal Science and Technology (ICC)

ICC Newsletter, No. 7, September 1986. ICC is also an AO of IUPAC. This issue of the newsletter has a front page item on that "inexhaustible subject" and one of humankind's oldest and still most essential staple foods — bread. Apart from that there is the usual news about ICC meetings and appointments.

Association of Official Analytical Chemists (AOAC)

The Referee, Vol. 10, Nos. 1–5, August–December 1986. These are recent issues of the AOAC newsletter. AOAC is an AO of IUPAC! All contain regular items on AOAC highlights, awards, various types of news, letters to the editor and "Wanted" (collaborators for example).

Groupement pour l'Avancement des Méthodes Spectroscopiques et Physico–Chimiques d'Analyse (GAMS)

GAMS — Information Bulletin No. 98, September–October 1986 is — as usual — in French. The issue contains lots of news about GAMS meetings and activities. GAMS is yet another AO of IUPAC (at the last count there were 29 in all).

European Federation of Biotechnology (EFB)

EFB Newsletter, 4/86. EFB is third in the list of AOs if you care to have a look in the *IUPAC Handbook 1985–87*. The front page of this issue is devoted to a profile of Prof. Dieter Behrens who celebrated his 60th birthday last year. Behrens takes credit for establishing EFB.

International Organization for Standardization (ISO)

ISO Bulletin, No. 10, October 1986 is entitled "Clearing the air" since it features an article on workplace atmospheres.

No. 11, November 1986 has a nice aerial view of Geneva on the front cover. Geneva is, of course, the home of ISO. We have not yet managed to obtain an aerial view of Cowley but the Secretariat is working on it. And guess what — ISO is not an AO of IUPAC. So what does this issue of the bulletin contain that is of interest to the average chemist? Well, there's an item on photographic plates, the usual news of international standards in process and a "nut-cracker" item on Tchaikovsky variations (including Tschaikovski, Tschaikowski, etc.).

United Nations Educational, Scientific and Cultural Organization (UNESCO)

NCUIIC Newsletter, Vol. 1, No. 5, July 1986. NCUIIC is the National Committee for University–Industry Interactions in Chemistry in Sri Lanka. *Details from NCUIIC (FP1/8/2), Ministry of Higher Education, 18 Ward Place, Colombo 7, Sri Lanka. Tel: 91527.*

UNESCO News, No. 189, October 1986 has news on decisions taken at the 125th session of UNESCO's Executive Board as well as an item on its 40th anniversary.

No. 190, November 1986 has more on the 40th anniversary. *Unesco News* is published in French and English (side by side).

United Nations Environment Programme (UNEP)

Industry and Environment, Vol. 9, No. 2, April/May/June 1986 contains major articles on training in industrial environmental management in the aluminium industry, 1972–86 — the role of the International Primary Aluminium Institute (IPAI); oil spill response-preparedness training at Mobil Oil exemplifies petroleum industry efforts in the area of spill response programmes; UK pollution control: new initiatives in industrial training; and *in situ* industrial training for high-level government officials — a case study in the textile industry.

Vol. 9, No. 3, 1986 features articles on aluminium recycling in the United States; development of the Regran Process for dust and sludge recycling in the Brazilian steel industry; recovery of zinc and lead from electric-furnace steelmaking dust at Berzelius; and the current status concerning the recycling of sealed Ni–Cd batteries in Japan.

International Programme on Chemical Safety (IPCS)

Sentinel: Health and Environment International, Vol. 3, No. 2, October 1986. The leading article in this issue is entitled "Tropical city boom — the health factor" and concerns urbanization in cities such as Mexico City. Other items include "Fish and cancer: Is there a link?" and "Wide variations in lead levels".

Pesticides code of conduct

The FAO (Food and Agriculture Organization of the United Nations) has published a booklet entitled *International Code of Conduct on the Distribution and Use of Pesticides*. The booklet contains the following 12 articles: 1. Objectives of the Code; 2. Definitions; 3. Pesticide management; 4. Testing of pesticides; 5. Reducing health hazards; 6. Regulatory and technical requirements; 7. Availability and use; 8. Distribution and use; 9. Information exchange; 10. Labelling, packaging, storage and disposal; 11. Advertising; 12. Monitoring and observance of the Code.

The code is published by FAO, Rome, Italy, 1986. Enquiries should be directed to Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.

Contributions of chemistry to health

The fifth in the CHEMRAWN series of conferences was held in Heidelberg, FRG, 22–26 September 1986. Its title was "Current and Future Contribution of Chemistry to Health — The New Frontiers".

◀ **Kongresshaus, Stadhalle, Heidelberg, venue of CHEMRAWN V.**

View of Heidelberg. ▼

◀ **Prof. Jan Thesing.**

CHEMRAWN, which stands for "*CHEM*ical *R*esearch *A*pplied to *W*orld *N*eeds", is the title of a series of IUPAC-sponsored conferences. CHEMRAWN V was organized by Gesellschaft Deutscher Chemiker (GDCh) and held at the Kongresshaus Stadhalle, Heidelberg last year.

CHEMRAWN V aimed to create recommendations for establishing advanced drugs and therapies. Prominent scientists reported on the state of the art, new frontiers and future needs in drug and medical research. The conference addressed scientists from universities, industry, the media and opinion leaders in science and health politics from national and international institutions.

The conference was opened by Prof. Jan Thesing, President of GDCh and Chairman of the CHEMRAWN V Committee. Prof. Valentin Koptyug, Vice-President of IUPAC then welcomed participants on behalf of the Union. The scientific programme of the conference included scientific excursions, poster sessions, panel discussions and lectures on the following themes:

- Progress in analytical chemistry: a stimulant for diagnosis and therapy
- Antibacterial and antiviral chemotherapy
- Parasitic infections
- The demographic development of population: changing incidence and distribution of diseases, a challenge to industrial civilization:
  - — cardiovascular diseases
  - — metabolic diseases
  - — neuropsychiatric disorders
  - — cancer: are we making progress in research and clinical treatment?

The following are abstracts of some of the lectures presented at the conference.

Participants at CHEMRAWN V. In front, from left to right are: Dr W. G. Schneider (IUPAC President, 1983–85), Prof. E. J. Grzywa (Member of the CHEMRAWN Committee) and Dr B. W. Rossiter (Chairman of the CHEMRAWN Committee).

Progress in diabetes management by self-testing with dry chemistry analysis

Soon after a rational treatment of Type 1 (insulin-dependent) diabetes became possible with the introduction of insulin into clinical medicine in 1922, the necessity of frequent and systematic metabolic monitoring as a quality control of insulin substitution became apparent. Leading diabetologists, such as Joslin in the USA and Stolte in Germany, propagated daily repeated monitoring of glucosuria by the patients themselves, as early as 50 to 60 years ago.

The methods then available for self-testing of the urine were cumbersome, and, more importantly, many physicians discouraged their patients from metabolic self-monitoring because they feared their patients might become neurotic, especially in Germany. For these reasons, and most regrettably, metabolic self-testing had been almost abandoned by the sixties. During the late seventies, diabetology rediscovered the benefits of achieving good metabolic control in order to prevent micro-angiopathic late complications of diabetes. At the same time, dry chemistry methods were developed for easy and reliable measurements of glucose in urine and blood.

Since then blood and urine glucose self-monitoring by the patients has revolutionized clinical diabetology. As patients have gradually taken over many of the diagnostic duties which were formerly performed by the physician they have also learned to make appropriate adjustments of therapy, i.e. self-adjustments of insulin dosage or diet regimen, based upon frequent and systematic metabolic self-monitoring. All of these benefits, made possible by the development of adequate self-control materials, can only be achieved if intensive and detailed efforts are made to train the patient to reliably and responsibly participate in his or her own therapy.

A number of studies document the substantial improvement of the overall quality of diabetes care due to the intensification of patient education and treatment with metabolic self-testing with dry chemistry analyses being the mandatory condition. Furthermore, with the introduction of blood glucose self-monitoring combined with the education of the patient for self-treatment, acute complications can be effectively prevented. Thus substantial savings of health care costs can be achieved.

With the introduction of dry chemistry methods for self-measurement of glucose in the urine and blood by the patient in parallel with intensified efforts to educate the patients with Type 1 diabetes to more actively participate in their treatment, a most substantial advance in diabetes care has been achieved — along with a saving of health care costs and the development of an effective partnership between the patient and his or her physician. To make patient education and materials for metabolic self-control available to all diabetic patients worldwide appears to be a task of major importance to health care providers in the late 1980s.

Prof. Michael Berger
Düsseldorf University, FRG

Available antiprotozoal drugs and future needs

The major protozoal diseases afflicting man on a global basis are toxoplasmosis, trichomoniasis and giardiasis. In addition to these, malaria, amoebiasis, the leishmaniases and the trypanosomiases are widely endemic in warmer climates where they contribute significantly to the burden of morbidity and mortality. Malaria, in particular, to which half the world's population is exposed, poses an increasing threat because of the ability of the malignant tertian parasite, *Plasmodium falciparum*, to develop resistance to each and every new drug that has been used against it. There are very few drugs with which to treat leishmanial and trypanosomal infections in the Old or New Worlds and those few may be relatively toxic or incompletely effective.

Further problems face the agriculturalist. Coccidiosis is an enormous burden on poultry farmers the world over. Babesiosis and theileriosis decimate herds of cattle in many countries, especially in the tropics and subtropics, while trypanosomiasis is a major obstacle to the extension of cattle farming in tropical Africa. Drugs for the prevention or treatment of these diseases are not effective in all cases and, again, drug resistance is a major problem in many instances. Even when drugs are

available, their cost to poor farmers may be prohibitive.

The development of new drugs targeted against protozoal diseases of the impoverished Third World is an expensive undertaking with no assurance to industry that development costs will be recovered, much less a profit made. Empirical drug screening is expensive and gives a low yield in terms of useful products, but the alternative, rational drug development based on increased knowledge of parasite biochemistry and physiology, is not an approach favoured by the pharmaceutical industry. Yet this must be the road to take in the future.

This paper discusses the main problems of antiprotozoal chemotherapy, recent progress based on rational drug design, and ways in which industry can help to provide the means for the research and development that is required.

Prof. Wallace Peters
London School of Hygiene and Tropical Medicine, UK

Future perspectives in the development of antiarrhythmic drugs

All antiarrhythmic drugs currently available possess one or more of four fundamental classes of action, and these can account for their efficacy in antagonizing known arrhythmogenic factors. In seeking to develop new antiarrhythmic agents it is pertinent to study other possible arrhythmogenic factors which could be suppressed.

Raised intracellular cAMP and calcium concentrations are responses to normal physiological controls, and highly abnormal ECGs occur in normal people under stress, but do not progress to life-threatening arrhythmias as they may do in susceptible individuals. Conversely, appropriately applied stimulation can precipitate ventricular fibrillation in normal myocardium.

Prof. E. M. Vaughan Williams.

Why does intense adrenergic stimulation not induce serious arrhythmia in healthy people? What are the additional factors increasing the probability of re-entry in response to extra-systoles in patients, which would be otherwise innocuous? Are such factors treatable?

There may be an anatomical substrate for re-entry, as a consequence of congenital abnormality (WPW), surgical intervention, or loss of tissue through disease. In such cases drug treatment may ameliorate the consequences of induced arrhythmias but cannot eliminate the underlying defect.

When ischaemia is an accessory factor, reduction of oxygen demand may reduce the probability of arrhythmia. Diversion of metabolism from fat to carbohydrate (perhexilene) or reduction of afterload, may spare oxygen and potentiate antiarrhythmic action. New and more selective class 3 agents (d-sotalol, clofilium) await assessment.

Meanwhile accurate diagnosis of the underlying reason for the induction of arrhythmia, and exhibition of the appropriate class of antiarrhythmic action, or combinations of actions, currently represent the best hope for advances in antiarrhythmic therapy.

Prof. E. M. Vaughan Williams, Oxford University, UK

Senile dementia: outlook for the future

Senile dementia is a pathological state of the brain underlying the clinical syndrome of global deterioration of intellect, cognition, behaviour, and emotion in an alert patient. Dementia can be caused by numerous diseases.

The two most common causes of dementia in old age are senile dementia of the Alzheimer type (SDAT) and multi-infarct dementia. Multi-infarct dementia which prevails in about 20% of cases is a chronic cerebral blood vessel disorder associated with vascular lesions causing widespread death of neuronal tissue.

SDAT is more likely to account for irreversible mental impairment in the elderly than all other causes put together. SDAT is accompanied by a broad spectrum of degenerative neuropathological and biochemical changes. The histological hallmarks are neurofibrillary tangles, neuritic (or senile) plaques, loss of nerve cells, abundant deposits of an abnormal protein called amyloid adjacent to and within cerebral blood vessel walls. The most consistently found chemical abnormalities in SDAT are a decrease in the cerebral cholinergic transmitter system, and a decline in cerebral metabolism and blood flow.

Scientific excursions are important features of many IUPAC sponsored conferences. CHEMRAWN V included several such excursions including one to E. Merck AG. The company is one of 13 IUPAC Company Associates in the Federal Republic of Germany.

A group of CHEMRAWN V participants visiting one of Merck's analytical laboratories.

Merck research scientist Dr Marion Wienrich demonstrates electrophysiological recordings of spinal cord neurones in tissue culture. Wienrich is working on the development of tachykinin-antagonists with potential as centrally acting analgesic drugs which might provide alternatives to opiates.

Dementia may develop at any age but is most common in advanced old age. Statistics for the United States are available to show that 10% to 15% of people aged 65 years or over display some form of mild to moderate dementia, and about 5% severe dementia. Of people aged 80 years and more as many as 20% suffer from dementia, 10% severely.

The fact that SDAT is so widespread has staggering medical and social implications considering the extraordinary increases in the number of old and very old people in many countries.

No one knows the cause or can prevent the course of most forms of senile dementia. However, the scope of research in academia and industry on the ageing brain and therapy of SDAT is expanding rapidly. A wide variety of approaches are in progress. So far, drugs which should enhance metabolic support of neurons, and selectively facilitate their cholinergic function hold most promise.

Prof. D. H. Hinzen
Boehringer Ingelheim Zentrale GmbH, FRG

Antidepressant therapy: present and future

The antidepressant drugs presently in use stem from the serendipitous findings of the antidepressant actions of imipramine (tricyclic and atypical antidepressants) and iproniazid (monoamine oxidase inhibitors). Subsequent developments have occurred on the background of the "monoamine" hypothesis of depression. The direct evidence for this hypothesis is extremely tenuous but it still forms a productive working base which has been strengthened by the findings that electroconvulsive therapy (ECT) has pharmacological actions akin to antidepressant drugs.

The initial molecular interaction of antidepressant drugs with endogenous "receptor" molecules is point-to-point but the consequences ripple throughout the brain in a sequence of adaptive responses including long-term changes in α_2- and β-adrenoceptors, 5-HT_1 and 5-HT_2 receptors.

What of the future? I would aim for new approaches to break into the sequence of complex adaptive responses found with current antidepressants. We need new molecules to modulate norepinephrine (NE) and 5-HT release, modulate GABA B receptor function, act as β-agonists (on brain but not heart) and modulate functional links between NE and 5-HT and GABA, Dopamine and 5-HT.

Our great problem however is our lack of understanding of the intrinsic functional brain abnormalities causing depression. We need more investment in basic neuroscience research, on the development of techniques "to get inside the head" e.g. PET, SPECT and functional NMR. We need active support of multidisciplinary groups applying

psychiatric, biochemical, pharmacological, and neurophysiological techniques and approaches with strong clinical impetus. Our total resource of talent is limited. It must be more efficiently organized and sponsored. We must somehow provide a structure whereby universities, government research institutions and the pharmaceutical industry can pool resources in clinically orientated neuropsychobiological research.

Prof. David Grahame-Smith
Oxford University, UK

Cancer chemotherapy, a classical concept?

The present state of evaluation and development of new drugs for cancer chemotherapy may be characterized by a plateau phase or, to put it more negatively, by stagnation. Does this mean that classical chemotherapy with cytoreductive (cytotoxic) drugs has reached its limits or can further progress in this field be expected for the future?

The progress in molecular biology of normal and cancer cells and better understanding of molecular pharmacology of anticancer drugs raise substantial expectations for a more rational design of agents with higher specificity against target biomolecules involved in cell proliferation and with better selectivity for the various types of cancer cells in man.

Thus design of substrate analogues of key enzymes of cell proliferation (DNA replication) acting as enzyme mechanism-based suicide inactivators would enhance specificity considerably. Those analogues would also be suited for coupling carriers such as monoclonal antibodies which render cell selectivity to them.

One essential prerequisite of any approach to this goal is the clear distinction and better understanding of the mutual relation between those two different concepts of selectivity and specificity.

H. J. Hohorst
Frankfurt University, FRG

CHEMRAWN V Proceedings

Proceedings of the CHEMRAWN V Conference: Current and Future Contributions of Chemistry to Health — The New Frontiers contain the main lectures of the conference. Edited by H. Machleidt, published 1987. Approx 600 pp. ISBN 3-527-26618-6. The proceedings, price DM 145.00, are available from VCH Verlagsgesellschaft, PO Box 1260/1280, D-6940 Weinheim, FRG.

IUPAC General Assembly

IUPAC holds its General Assemblies in odd-numbered years. This year, the 34th General Assembly will be held in Boston, USA, during August.

IUPAC's General Assemblies are held every other year. They consist of a set of meetings of IUPAC's Council, Bureau, Commissions and Committees. At any one time over 30 meetings may be taking place simultaneously. Only members of IUPAC bodies, National Representatives and invited observers may attend these meetings. This year, for the first time, a limited number of Affiliates may attend as observers.

This year's General Assembly will take place at Boston University, 21–29 August. Boston University is located about 2 miles west of downtown Boston, Massachusetts. Participants will be accommodated either on campus or at any one of a number of hotels in the Boston area. Registration will be at the Boston University Science Center.

The climax of the General Assembly is reached towards its end when the Bureau and Council of IUPAC meet. The Bureau acts for the Union during intervals between meetings of the Council. The Council is composed of delegates of the 42 member countries. The Bureau and all the Committees, Divisions and Commissions of IUPAC are responsible to the Council.

Boston University campus and the Boston skyline.

BOSTON

At the General Assembly, the Council elects new officers of the Union. These are the President, Vice-President, Secretary General and Treasurer.

Recent General Assemblies have been held in France (1985), Denmark (1983), Belgium (1981), Switzerland (1979) and Poland (1977).

Koptyug to become President of IUPAC

Prof. Valentin Koptyug will assume office as President of IUPAC at the end of the Boston General Assembly after having served for two years as Vice-President (President-Elect) since his election at the General Assembly in Lyon (France) in 1985 (see *CI*, Vol. 7, No. 6, p. 7 (1985)).

Koptyug was born in 1931, in Yuchnov, Kaluga District, USSR. He graduated from the Mendeleev Institute of Chemical Technology, Moscow, in 1954 and was appointed Junior Research Fellow in 1957. In 1959 he was appointed Senior Research Fellow at the Institute of Organic Chemistry, Novosibirsk, later becoming Head of Laboratory and Head of Department. He was awarded his Doctorate of Chemistry in 1963 and became Professor (of physical organic chemistry) in 1965.

He is Vice-President of the Academy of Sciences of USSR and President of the Siberian Branch of the Academy of Sciences of the USSR. He became an Academician in 1979. He was Rector of Novosibirsk State University from 1978 to 1980.

Koptyug's research interests include mechanisms of organic reactions, carbonium ion chemistry, spectroscopy and computer applications in chemistry and chemical education.

He is the author of some 300 articles, 30 patents and three monographs and is also a member of the editorial boards of three scientific journals.

Prof. Valentin Koptyug.

Koptyug runs the largest computerized spectroscopic database in the USSR. His group has created spectral databases for IR, NMR, mass spectrometry and UV spectroscopy, as well as a chemical structure database associated with these spectral data property files. He continues to expand his spectral database by collecting and converting into computer-readable form all available spectra from both published and unpublished sources.

In addition to the spectral database work, Koptyug's laboratory is working on the creation of a very large database of chemical structures as part of a joint project with groups in Moscow and the German Democratic Republic. They hope to have a structure-searchable database of the millions of compounds that appear in the scientific literature of USSR and other Socialist countries.

Koptyug became a Titular Member of the Commission on Molecular Structure and Spectroscopy (I.5) in 1957, was elected to the Bureau in1979 and re-elected in 1983. He has also been Chairman of the Advisory Committee on Chemical Data Bases.

Presidents of IUPAC

Prof. Ch. Moureu	France	1920–22
Sir William Pope	UK	1923–25
Prof. E. Cohen	Netherlands	1926–28
Prof. E. Biilmann	Denmark	1928–34
Prof. N. Parravano	Italy	1934–38
Prof. Marston-Taylor Bogert	USA	1938–47
Prof. H.-R. Kruyt	Netherlands	1947–51
Prof. A. Tiselius	Sweden	1951–55
Prof. A. Stoll	Switzerland	1955–59
Prof. W. A. Noyes, Jr.	USA	1959–63
Lord Todd	UK	1963–65
Prof. W. Klemm	Federal Republic of Germany	1965–67
Prof. V. N. Kondratiev	USSR	1967–69
Dr. A. L. G. Rees	Australia	1969–71
Prof. J. Benard	France	1971–73
Prof. Sir Harold Thompson	UK	1973–75
Dr. R. W. Cairns	USA	1975–77
Prof. G. Smets	Belgium	1977–79
Prof. H. Zollinger	Switzerland	1979–81
Prof. S. Nagakura	Japan	1981–83
Dr. W. G. Schneider	Canada	1983–85
Prof. C. N. R. Rao	India	1985–87
Prof. V. A. Koptyug	USSR	1987–89

The city of Boston

Boston is the capital of Massachusetts. The city is named after the port in Lincolnshire, England. It is situated on a hilly peninsula where the Mystic and Charles rivers flow into Massachusetts Bay. It is New England's most important seaport and has one of the finest natural harbours in the USA.

BOSTON

▲ Beacon Hill's brownstone homes and cobblestone streets in "Old Boston".

Paul Revere Statue. While living in Boston, Revere, a brilliant silversmith, engraved his famous scene of the Boston Massacre, took part in the Boston Tea Party in December 1773, and, on the night of April 18, 1775, departed on his historic ride to warn the residents of Lexington and Concord of the approach of the British Redcoats. ▶

The John Fitzgerald Kennedy (JFK) Library. ▼

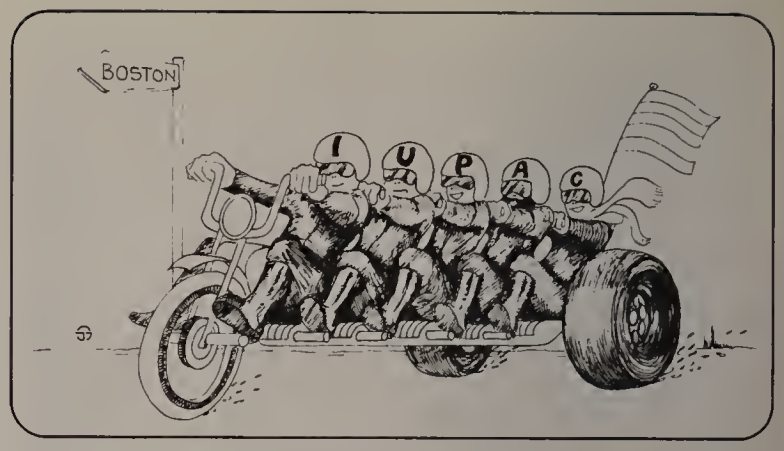
◀ *Constitution*, nicknamed "Old Ironsides" because of the strength of her oak construction, has been restored and is now berthed at the Charlestown Navy Yard. This heavy frigate was undefeated in a succession of major encounters with the British fleet in the War of 1812. The ship, launched in Boston in 1797, was most recently restored between 1973 and 1975 and is now preserved as a symbolic monument of its historic past. The *Constitution* is the oldest commissioned warship afloat in the world.

Reclamation of swampy tidal flats has more than doubled the size of Boston's original peninsula. The city has grown by annexation and reclamation to more than 35 times its colonial size. It is now the largest city in New England and the focus of a metropolitan area of 92 cities and towns and more than three million people.

Boston is 200 miles closer to Europe than is New York. Just across the harbour is Logan International Airport, only two miles and a few minutes' ride from downtown. The many scenic and historic attractions of New England are easily accessible by automobile, bus, train or regional airlines.

The city is one of the world's major medical research centres, the second largest financial centre in the country, and a leading manufacturing area for printing and publishing, apparel, food processing, non-electrical machinery and metal fabrication. A number of companies with strong involvement of chemical science or technology have production and/or research facilities located in the greater Boston area. These include Cabot Corp., Dow, DuPont, General Electric, W. R. Grace, Monsanto and Gillette.

Eastern Massachusetts is a major centre for "high-tech" industries, for example, computers, robotics, automation equipment for the production of semiconductor materials and devices, communications and advanced materials. Companies with production and/or research facilities in eastern Massachusetts include Digital, Nixdorff, Prime, Wang, Honeywell, Gould, G.T.E., Apollo, Norton, Raytheon and many others.



Since the founding here in 1635 of Boston Latin School, the city has been an education centre. Today there are 56 colleges and universities in the metropolitan area. Among these are seven with PhD programmes in chemistry: Boston College, Boston University, Brandeis, Harvard, Massachusetts Institute of Technology (MIT), Northeastern and Tufts.

Boston is noted for its cultural facilities, with many museums, theatres, performance centres, libraries and the world-famous Boston Symphony Orchestra. There are four seasons of professional and collegiate sports. Along the coast there are miles of public beaches and many popular recreational activities including deep sea fishing and sailing.

Boston has a cool, temperate, humid mid-latitude climate. The summers are warm with temperatures in the region of 22°C. Lightweight garments are recommended for participants attending the General Assembly.

Conferences

101st AOAC Meeting

The 101st AOAC (Association of Official Analytical Chemists) Annual International Meeting and Exposition on analytical methodology will be held in San Francisco, California, USA 14–17 September 1987. The meeting will include symposia on the following five topics: robotics; biotechnology; mycotoxins; industrial analytical chemistry; and cholesterol oxidates. *For further details, contact the AOAC office at 1111 N. 19th St, Suite 210, Arlington, VA 22209, USA. Tel: (703) 522–3032.*

Chemical engineering conferences

The following are two events of the European Federation of Chemical Engineering in 1987. For details please contact the *Secretariat* shown in parentheses.

- 9th International Congress of Chemical Engineering, Chemical Equipment Design and Automation. Prague, Czechoslovakia, 31 August–4 September (9th CHISA Congress, POB 857, CS-111 21 Praha 1, Czechoslovakia).
- Third World Congress on Desalination and Water Re-use. Cannes, France, 14–18 September (Société de Chimie Industrielle, 28, rue St-Dominique, F-75007 Paris, France).

Controlled release of bioactive materials

The 14th International Symposium on Controlled Release of Bioactive Materials will take place in Toronto, Canada, 2–5 August 1987. *Further details from Controlled Release Society, Inc. Administrative Office, 16 Nottingham Drive, Lincolnshire, IL 60015, USA. Tel: (312) 940–4277.*

IUPAC-Sponsored Conferences

31st International Congress of Pure and Applied Chemistry
Sofia, Bulgaria, 13–18 July 1987

▲ **Square in front of the National Theatre, Sofia.**

View of Sofia showing the Alexander Nevsky Cathedral and (in the foreground) St Sophia Church. ▶

The 31st IUPAC Congress, organized by the Bulgarian Academy of Sciences, will be under the patronage of Todor Zhivkov, President of the State Council of the People's Republic of Bulgaria.

Sofia, the capital city of Bulgaria, with its one million inhabitants is a modern city with a history going back more than 5000 years. It is one of Europe's most ancient cities and was originally known as Serdika or Sredets. It is situated in the heart of the Balkan Peninsula at the crossroads between East and West.

The scientific sessions will be held in the National Palace of Culture, an important international centre for social, scientific and cultural events. It has all the usual modern facilities.

The Congress will be formally opened at the National Palace of Culture on Monday 13 July. The scientific programme consists of daily plenary lectures followed by nine parallel sections and poster sessions. The official language of the Congress in English. Simultaneous translation facilities will not be provided.

The plenary lecturers include D. Behrens (FRG), S. G. Christov (Bulgaria), J. Hirschfelder (USA), G. Khorana (USA), V. A. Koptyug (USSR), N. Plate (USSR), I. Prigogine (Belgium), B. Pullman (France), C. N. R. Rao (India).

The scientific programme will consist of the following topics:

1. Analytical chemistry

General aspects of analytical chemistry. New theoretical developments; new instrumentation and techniques in electroanalytical chemistry; application of microcomputers; applied atomic and molecular spectroscopy.

Particular aspects of analytical chemistry. Participation in biotechnology: medicinal, pharmaceutical and food areas; environmental analysis: microchemical and trace analysis; methods of analysis.

2. Education

Chemical education in the Third World; public information about chemistry; chemistry teaching.

3. Chemical engineering

Phase equilibria and fluid properties; advanced separation processes and equipment; metal recovery; hydrodynamical and heat-transfer processes; energy saving solutions; CAD: reaction engineering; biotechnology and biochemical reactors.

4. Industrial chemistry

Agrochemistry, herbicides, pesticides; biotechnology; essential oils; pharmaceutical chemistry.

5. Inorganic chemistry

Solid state chemistry and inorganic materials; surface chemistry of solids; ultrapure elements and compounds; coordination and bioinorganic chemistry; energy conversion materials and inorganic photochemistry.

6. Organic chemistry

Asymmetric synthesis; bioorganic chemistry and biosynthesis; computer-aided synthesis and computergraphics, gas phase reactions; new synthons for organic reactions.

7a. Physical chemistry

Phase transitions; quantum chemistry — elementary steps in kinetic processes; surface science including long-range forces; colloidal systems; thin liquid films.

7b. Electrochemistry

Electrocrystallization and metal deposition; electrocatalysis. Liquid–liquid interfaces; chemically modified electrodes; spectroscopic methods in electrochemistry; electrochemical hydrogen production; fuel cell technology; electrochemical power sources.

8. Polymers

Synthesis of polymers; electrically conducting organic polymers; polymers in medicine.

9. Clinical chemistry

Standardization of methods and equipment in clinical chemistry; diagnostic strategies in clinical chemistry; automation in clinical chemistry; economic efficiency of laboratory investigations; liquid chromatography; therapeutic drug monitoring; trace elements; laboratory information systems; quality control; enzymes and isoenzymes; blood coagulation; proteins; lipids and lipoproteins; hormones; acid–base metabolism; water and electrolyte balance; carbohydrates.

The Congress will also include exhibitions of Bulgarian and foreign manufacturers' chemical products, chemicals, laboratory and industrial apparatus and devices. There will also be exhibitions of scientific books and international magazines on chemistry and related subjects organized by well-known publishing houses.

The registration fee for active participants is US-$200.00. This covers participation in the scientific programme and volumes containing the poster abstracts and lectures in one of the sections. It also includes tickets for two receptions and a symphony concert. A social programme and various excursions have also been arranged.

The weather in Sofia is usually warm in July — about 25°C. Formal dress will not be required for the social events.

2nd International Workshop on the Behaviour of Pollutants in Porous Media
Bet Dagan, Israel, 14–19 June 1987

Pollution of porous media and the subsequent pollution of ground and surface waters are of increasing concern to scientists and policy makers throughout the world. The first workshop held in 1983 reviewed the state-of-the art of the problem and the methods of dealing with it. In light of recent developments in this field it is necessary to review the scope of the problem, the processes involved, and the most recent management technology. The objectives of the 2nd workshop are to define the hazards posed by organic and inorganic chemicals with regard to water quality; to discuss recent advances in understanding the processes governing the fate of pollutants in porous media; and to review and evaluate various management techniques which are in use or proposed for the renovation and restoration of the unsaturated zone and groundwater which have been polluted by organic and inorganic compounds.

The workshop will consist of three days of invited lectures and a two-day field trip. Talks by leading scientists in the field of pollution control from Australia, England, France, Germany (FRG), Holland, Israel and the USA will include

1. Dimensions of groundwater pollution — a world perspective.
2. Restoration of aquifers polluted with hydrocarbons.
3. Association of toxic organic chemicals with

suspended solids, soluble polymers and heavy metals.
4. Abiotic transformations of toxic organic chemicals in the liquid phase and in sediments.
5. Modelling of adsorption and movement of organic chemicals in the saturated and unsaturated zone.
6. Microbiological aspects of heavy metal behaviour in porous media.
7. Selenium dynamics and transformations in soils and clay minerals.
8. Soil redox effects on chemical mobility and plant availability of trace and toxic metals.
9. Composition and stability of toxic inorganic compounds prevailing in wastewater and sludges of various sources.
10. Transport of toxic organic chemicals from disposal sites.

The working language of the workshop is English and summaries of all lectures will be provided in the programme booklet in English. Accommodation will be available in hotels in Tel Aviv and transportation to and from Bet Dagan will be provided. The registration fee for participants is US-$200.00 and covers all workshop functions and a field trip. The climate during June in Israel is warm and dry, but a light jacket is recommended. Pre-and post-workshop tours throughout Israel can be arranged.

4th Symposium on Organometallic Chemistry Directed Toward Organic Synthesis (OMCOS-IV)

Vancouver, British Columbia, Canada, 26–30 July 1987

The 4th Symposium on Organometallic Chemistry Directed Toward Organic Synthesis will be held at the University of British Columbia.

The following plenary lectures will be given:

- Metal catalysed carbonylations and oxidation-reduction (H. Alper, Ottawa, Canada)
- Transformations of organic compounds mediated by organotransition metal complexes (R. G. Bergman, Berkeley, USA)
- The development of stereoselective organic reactions (D. A. Evans, Cambridge, USA)
- Stereochemical control in organic synthesis using silicon compounds (I. Fleming, Cambridge, England)
- α-Chiral allylboronates — reagents for asymmetric synthesis (R. W. Hoffmann, Marburg, West Germany)
- Selective carbon–carbon bond formation involving metal–silicon exchange reactions (I. Kuwajima, Tokyo, Japan)
- Metal-directed stereoselective functionalizations of alkenes in organic synthesis (W. Oppolzer, Geneva, Switzerland)
- New organometallic reagents for olefin synthesis (J. Schwartz, Princeton, USA)
- Organoaluminium reagents for selective reactions (H. Yamamoto, Nagoya, Japan)

In addition there will be lectures from invited speakers on the following topics:

Recent developments in organocopper chemistry
Mechanisms of group transfer in anionic transition metal hydrides and alkyls
Chirality control and molecular recognition in synthesis
Asymmetric synthesis catalysed by chiral ferrocenylphosphine–metal complexes
Total synthesis of polyprenoid natural products via Pd(O)-catalysed oligomerizations
Synthesis via strained ring organics and transition metals
Stereospecific synthesis of olefins through sequential cross-coupling reactions
The use of some bifunctional reagents in organic synthesis
Organocuprate addition to α,β-unsaturated carbonyl compounds: synthetic and mechanistic aspects
Transition metal carbene complexes in organic synthesis

The official language of OMCOS-IV is English.

Accommodation is available in the Walter Gage Student Residence complex located on the University of British Columbia campus. The residences are three modern high-rise buildings. Each floor contains four "quads" consisting of six single bedrooms in a group with a large shared bathroom, and a lounge area. Many of the rooms have a panoramic view of the mountains, Burrard Inlet, and Howe Sound.

The University of British Columbia lies secluded on approximately 450 wooded hectares 10 kilometres from downtown Vancouver. The University's setting, with views of sea and mountains, is one of the most spectacular in the world.

Vancouver is Canada's third largest city, with a metropolitan population of 1.5 million. It is the jewel of North America's Pacific coast, set on a magnificent natural harbour surrounded by coastal mountains. Vancouver offers visitors an almost limitless choice of activities — stroll through Stanley Park, visit historic Gastown, experience authentic *dim sum* in Chinatown (the second largest on

the continent), enjoy the spectacular killer whale show at the famous Vancouver Aquarium, or visit Granville Island on the south shore of False Creek — an oasis for shoppers, boaters, theatre-goers, sightseers and artists.

The province of British Columbia contains some of the most beautiful mountain and coastal scenery in the world and offers an unlimited variety of recreation for those wishing to take a pre- or post-conference vacation.

July is one of the warmest months of the year with temperatures ranging from 11°C to 23°C. Evening temperatures are rarely below 10°C. Casual dress is recommended for the conference.

25th International Conference on Coordination Chemistry (ICCC)
Nanjing, China, 26–31 July 1987

The scientific sessions will be held in Nanjing, a beautiful city with a long history, picturesque scenes and precious relics from a splendid cultural heritage. The programme is limited to two kinds of presentation — invited lectures and posters. About 30 invited lectures will be presented in five parallel morning and afternoon sessions with poster sessions all day. It is hoped to group the posters thematically and to have them introduced by a coordinator. Subjects of special interest will be discussed by panels.

The conference will focus on the recent development of coordination chemistry with emphasis on the following areas:

- Structure and bonding
- Energetics, dynamics–kinetics and mechanisms
- Syntheses, characterization and spectroscopy
- Bioinorganic chemistry
- Catalysis and applications.

The conference language will be English. Several social events, a programme for accompanying persons and post-conference tours will be organized. Participants will find hotel accommodation of different classes available near the Conference Center. The conference fee will be about US-$195.

Nanjing is a city with an ancient cultural background and so there are many places of interest to visit. These include the Drum Tower Park, the Ming Imperial Palace, Purple Mountain, Dr Sun Yat-sen's Mausoleum, Tomb of Emperor Hongwu, Linggu Park, the Changjiang River Bridge, Museum of Taiping Heavenly Kingdom, Zuanwu Lake, Qixia Mountain and the Thousand-Buddha Cliff. There is also a wide variety of other attractions available, such as local cuisine, music and swimming.

9th International Conference on Chemical Education (9-ICCE)
São Paulo, Brazil, 26–31 July 1987

This conference will be held on the campus of the University of São Paulo, the country's largest university with about 45 000 students and 4800 faculty members. Plenary lectures will be delivered in the university's amphitheatre, a modern hall with all conference facilities. Most other conference activities will take place in the adjacent "beehive", a ground-level building with a larger number of small lecture halls and conference rooms.

The objective of the conference is to bring together all people interested in the improvement of chemical education. The central theme of the conference is "Chemistry for our new world". It embraces advances in the global comprehension of specific problems of chemical education in all parts of the world; definitions of trends and new directions in chemical education and also innovative practices aimed at awakening in the young student a broad concern for the environment and the human beings living therein.

The following themes all related to the central theme will be covered by the conference

1. Good chemistry in all circumstances,
2. Introducing chemistry to the citizen,
3. Research in learning applied to chemistry.

The conference programme will consist of

- plenary lectures
- special presentations
- small group discussions
- poster presentations
- demonstrations of experiments, audio-visuals, and microcomputer programmes
- displays of textbooks and equipment
- informal meetings

Well-known chemical educators from various parts of the world will discuss the challenges of teaching chemistry, thus broadening the participants' view of chemical education. Other speakers, equally well known, will present ways to disseminate the knowledge of chemistry not only among students, but among the general public as well.

The conference language will be English; simultaneous translation will not be available. The registration fee will be about US-$150.00. A 10% reduction in the registration fee will be granted to

The 9th International Conference on Chemical Education will be held on the campus of the University of São Paulo.

IUPAC Affiliates. Hotels in various price ranges are available in the city centre. Arrangements are also being made to accommodate participants in student dormitories located on the university campus.

At the time of the conference it will be winter in São Paulo. However, temperatures seldom fall below 8°C and may climb as high as 25°C. Drizzles should be expected.

São Paulo is a business city with 13 million inhabitants. It is also an entertainment capital and gastronomic paradise, where the delicacies from all parts of the world can be sampled. The typical barbecue is served in "churrascarias" (barbecue houses) with generous portions of meat. Spectacular views of the city can be had from many places. The beautiful beaches of Guaruja which can be enjoyed even in winter are one hour's drive away.

8th International Symposium on Solute–Solute–Solvent Interactions
Regensburg, FRG, 9–14 August 1987

The 8th International Symposium on Solute–Solute–Solvent Interactions (8th ISSSSI) will be held in the Chemistry Department of the University of Regensburg. Accommodation will be provided in the Student's Hall of Residence and will consist of single or double rooms. Participants wishing to stay in a hotel should indicate this on the registration form.

The programme provides for invited lectures, contributed papers, and poster contributions. There is no official language for this symposium although English is strongly recommended. No translation facilities will be available.

ISSSSI is a biennial conference encompassing a variety of topics based on the properties of aqueous and non-aqueous solutions and molten salts. Subjects ranging from theoretical treatments to industrial applications are included in ISSSSI which will thus be of interest and value to analytical, preparative, physical and theoretical chemists and chemcial engineers working in the field of solution chemistry.

The following sessions will be featured at the 8th ISSSSI:

1. Theories of liquids, solutions and melts.
2. Thermodynamic and transport properties of liquid systems.
3. Spectroscopic, dielectric and kinetic investigations of solute–solute and solute–solvent interactions.
4. Computer-assisted methods in solution chemistry; databases.
5. Modern technologies based on electrolyte solutions (high-energy batteries, electrodeposition and related topics, electro-organic syntheses, etc.).
6. The physical chemistry of small carbohydrates.

By combining the traditional themes (Sessions 1 to 3) with developments in selected fields of applied research (Session 4 to 6), actual problems will be addressed both by scientists in pure research and scientists engaged in advanced developments.

The conference fees are DM200– for participants before 30th June and DM250– after; DM80– for accompanying persons, and DM40– for students. A reduction of 10% is available to IUPAC Affiliates.

The charming city of Regensburg (about 150 000 inhabitants), situated on the Danube, is two thousand years old. Visitors to Regensburg are amazed that such a city can still be found. With its oldest visible architectural features dating back to Roman times, a well-preserved centre of medieval character, a fine Gothic cathedral, about 50 churches and chapels dating from the 9th century to modern times, and the Patrician palaces from the 13th and 14th centuries, it offers many attractions to the visitor.

Guided tours through the city of Regensburg will be arranged. A post-conference tour is planned to famous places in Bavaria. A programme organized for visitors attending but not participating in the conference will offer further tours to the surrounding countryside and its places of historical interest and scenic beauty.

Faculty of Chemistry and Pharmacy, University of Regensburg, FRG.

8th International Symposium on Cationic Polymerization and Related Processes
München, FRG, 10–14 August 1987

The topics of this conference are:

1. Industrial applications of cationic polymerizations.
2. Fundamental carbonium ion chemistry.
3. Ring-opening polymerizations.
4. High-energy induced processes.
5. Cationic polymerization mechanism.
6. Cationic olefin polymerization.
7. Telechelics, macromonomers, and block and graft copolymers.
8. Non-carbon polymers via cationic polymerization.

Main lectures of 30 minutes' duration will form the basis of the scientific programme. These will be supported by 15-minute communications. An exhibition of equipment and literature will be held during the symposium.

The official conference language will be English.

The social programme includes an informal reception, an official reception, concert or theatre and a symposium dinner.

World Congress of Theoretical Organic Chemists
Budapest, Hungary, 12–19 August 1987

This Congress is organized by the World Association of Theoretical Organic Chemists (WATOC) and the Hungarian Chemical Society. It will consist of two consecutive sections. Section A will deal with basic topics and Section B will be concerned with applications to biomedical fields and chemical industry:

Section A (12–15 August)
Concepts in theoretical organic chemistry
Structure and spectra
Reactivity and reactions
Intra- and intermolecular interactions

Section B (17–19 August)
From supermicros to supercomputers
Catalysis and solid state chemistry
Biomolecular systems
Computer-aided molecular design and synthesis planning

Participants may register for one or both sections. The registration fee for each section is US-$300.00 or US-$500.00 for both. The fee covers attendance for all sessions, a copy of the book of abstracts, business luncheons and admission to reception, concert and banquet.

The official language of the Congress is English. No simultaneous interpretation will be available.

Lectures and poster sessions will be held in the MSZMP Community Hall, Budapest. This provides a pleasant atmosphere for scientific events. Business luncheons will be served in the vicinity.

Budapest, the capital of Hungary, is in Central Europe and can easily be reached by air, train or car from any European capital. A bus connection between Vienna and Budapest is also available as well as a hydrofoil service on the river Danube.

The weather in Hungary is normally hot in August. Most days are pleasant and sunny although rain is possible. The average temperature is 24–30°C. Evenings may be cool, however.

International Symposium on Polymers for Advanced Technologies
Jerusalem, Israel, 16–21 August 1987

This symposium aims to bring together academia and industry from around the world to focus on several new aspects of polymer research and development and its role and impact on the emerging science-based technologies. New avenues of creative scientific endeavour to meet the challenges of the 21st century will be highlighted, reviewed and discussed.

The symposium will be composed of plenary and sectional lectures to be presented by leading experts, contributed original papers, poster sessions and discussion panels. The main topics for review will be split into three sections:

A *Polymers for biosystems*
- Polymers as drug carriers
- Polymers for bioseparations
- Polymers for biosensors
- Biocompatible polymers in medical applications
- Polymers as matrices for biological synthesis

B *Polymers in radiation related technologies*
- Radiation resistant/sensitive polymers
- Radiation modified polymers
- Photoconductive polymers
- Radiation cured polymer systems

C *Polymers for advanced structures*
- Polymers for high-performance fibres and plastics (LCP, rigid, semi-rigid and flexible polymers)
- Thermoplastic elastomers in advanced rubber compositions
- Interpenetrating networks
- Engineering polymer blends
- Electro-conductive and piezo-electric polymers

Invited speakers include:

S. L. Candau (France)
A. Chapiro (France)
N. B. Graham (UK)
P. Hergenrother (USA)
S. P. Hersh (USA)
E. Katzir-Katschalski (Israel)
M. Jaffee (USA)
J. Klein (FRG)
S. Kwolek (USA)
B. Landa (Israel)
P. J. Lemstra (Netherlands)
C. R. Lowe (UK)
R. Marchessault (Canada)
H. F. Mark (USA)
D. Prevorsek (USA)
H. Ringsdorf (FRG)
D. Tanner (USA)
E. Tsuchida (Japan)
I. M. Ward (UK)
G. Wegner (FRG)
M. Wilchek (Israel)
C. G. Wilson (USA)
F. H. Winslow (USA)

In addition, a special panel, composed of leading experts from several countries, will be organized to discuss the Strategy on Advanced Polymers in the world for the approaching 21st century. This panel will include leading experts from many of the world's largest multinational companies.

The symposium takes place in a country which is devoting a considerable part of its resources to scientific research and to the development of new science-based industries. In conjunction with the symposium, special arrangements can be made with the organizing committee to visit Israeli companies and R&D establishments dealing with advanced technologies. In addition, an exhibition related to the symposium topics will take place within the framework of the symposium.

The location of the meeting will be the Laromme Hotel, Jerusalem. The official language of the symposium will be English.

2nd Nordic Symposium on Trace Elements in Human Health and Disease
Odense, Denmark, 17–21 August 1987

This symposium will focus on current trends and controversial key issues in trace element research and emphasize recent major achievements, important areas with gaps in knowledge and specific needs for future research. Rather than merely reviewing the state of the art, the symposium will identify important avenues that trace element research is likely to follow in the near future.

Scientific sessions

These goals will be pursued by asking invited speakers to present brief critical reviews on innovative approaches and controversial topics, followed by extended discussions. Round-table discussions will be organized, and task groups asked to prepare reports summarizing pertinent findings. Free communications and guided poster sessions will also be arranged. Minimal time will be allowed for platform presentations, but time for extensive discussions of both oral communications and posters will be organized.

The scientific sessions are expected to cover the following general subject areas:

1. Dietary intake and requirements.
2. Environmental and occupational exposures.
3. Experimental approaches.
4. Analytical methodology.
5. Mechanisms in essentiality and toxicity.
6. Risk evaluation and preventive measures.

The official language of the symposium will be English. No simultaneous translation facilities will be available.

Venue

The Nordic Symposia on trace elements are biennial international scientific meetings held in the Nordic countries. In 1987, the scientific sessions will take place at the Odense University campus, a modern architectural creation situated in a pastoral landscape in the outskirts of Odense. The city will celebrate its 1000-year birthday in 1988. Odense is also the birthplace of Hans Christian Andersen.

Three hotel categories as well as a student hostel will be available. The social programme, meals, as well as printed materials will be included in the registration fee.

August is a splendid time for visiting Odense and the island of Fyn. A multi-faceted social programme for delegates and accompanying persons will be arranged. An informal musical event will be scheduled. An olympic-length swimming pool, a running track and an 18-hole golf course are located in the immediate vicinity of the university.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1987

Quantitative Luminescence Spectrometry

11–14 May. 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences. Ghent, Belgium.
(Dr Willy R. G. Baeyens, Laboratory of Pharmaceutical Chemistry and Drug Quality Control, Faculty of Pharmaceutical Sciences, State University of Ghent, Harelbekestraat 72, B-9000 Ghent, Belgium.)

CHEMRAWN VI

17–22 May. CHEMRAWN VI. World Conference on Advanced Materials Needed for Innovations — Energy, Transportation and Communications. Tokyo, Japan.
(CHEMRAWN VI Coordinating Office, The Chemical Society of Japan, 1-5 Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Free-Radical Polymerization

17–23 May. International Symposium on Free-Radical Polymerization: Kinetics and Mechanisms. Santa Margherita Ligure, Nr. Genoa, Italy.
(Dr Barbara Valenti, SML-87, c/o Centro Macromolecole CNR, Corso Europa 30, 16132 Genoa, Italy.)

High Temperature and Energy-Related Materials

25–29 May. 5th International Conference on High Temperature and Energy-related Materials. Rome, Italy.
(Prof. G. De Maria, Dipartimento di Chimica, Università di Roma "La Sapienza", P. le Aldo Moro 5, 00185 Roma, Italy.)

Organosilicon Chemistry

7–12 June. 8th International Symposium on Organosilicon Chemistry. St. Louis, Missouri, USA.
(Prof. Peter P. Gaspar, Department of Chemistry, Washington University, St Louis, Missouri 63130, USA.)

Pollutants in Porous Media

14–19 June. 2nd International Workshop on Behaviour of Pollutants in Porous Media. Bet Dagan, Israel.
(Dr Zev Gerstl, Institute of Soils and Water, ARO, Volcani Center, PO Box 6, Bet Dagan 50-520, Israel.)

Boron Chemistry

22-26 June. 6th International Conference on Boron Chemistry. Bechyne, near Tabor, Czechoslovakia.
(Dr S. Hermanek, Institute of Inorganic Chemistry, Czechoslovak Academy of Sciences, 250 68 Rez near Prague, Czechoslovakia.)

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule "Carl Schorlemmer", Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseburg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-supported Organic Reagents and Catalysts. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands.
(Prof. J. Reedijk, State University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria.

(31st International Congress of Pure & Applied Chemistry, Centre of Chemistry, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Block 11, 1113 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Kobe, Japan.
(Prof. Michio Kobayashi, Secretary, ICHAC-1987, c/o Kinki Chemical Society, 1-8-4, Utsubo-Honmachi, Nishiku, Osaka 550, Japan.)

Macrocyclic Chemistry

20–23 July. 12th International Symposium on Macrocyclic Chemistry. Hiroshima, Japan.
(Prof. Eiichi Kimura, Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine , Kasumi 1-2-3, Minami-ku, Hiroshima 734, Japan.)

Organometallic Chemistry

26–30 July. 4th International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS IV). Vancouver, BC, Canada.
(Prof. Michael D. Fryzuk, Department of Chemistry, The University of British Columbia, 2036 Main Hall, Vancouver, British Columbia, Canada V6T 1Y6.)

Chemical Education

26–31 July. 9th International Conference on Chemical Education. Sub-title: "Chemistry for our New World". São Paulo, Brazil.
(Prof. Ernesto Giesbrecht, Instituto de Quimica, Universidade de São Paulo, Caixa Postal 20.780, 01498-São Paulo, SP, Brazil.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China.
(Prof. Xiao-Zeng You, Conference Secretary, XXV ICCC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany.
(Prof. J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Cationic Polymerization

10–14 August. 8th International Symposium on Cationic Polymerization and Related Processes. Munich, FRG.
(Prof. Oskar Nuyken, Lehrstuhl I für Makromolekulare Chemie, Universität Bayreuth, D-8580 Bayreuth, Federal Republic of Germany.)

Theoretical Organic Chemistry

12–19 August. World Congress of Theoretical Organic Chemists. Budapest, Hungary.
(E. A. Lang, WATOC Congress, Hungarian Chemical Society, H-1061 Budapest, Anker Köz 1, Hungary.)

Polymers for Advanced Technologies

16–21 August. International Symposium for Advanced Technologies. Jerusalem, Israel.
(Dr Steven Daren, IUPAC International Symposium on Polymers for Advanced Technologies, POB 50432, Tel-Aviv 61500, Israel.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark.
(Trace Elements in Human Health and Disease, Odense Tourist Association, Conference Department, The Town Hall, DK-5000 Odense C, Denmark.)

Thermal Analysis

23–28 August. 4th European Symposium on Thermal Analysis and Calorimetry. Jena, GDR.
(Prof. A. Feltz, Sektion Chemie, Friedrich-Schiller-Universität, DDR-6900 Jena, Steiger 3, GDR.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria.
(6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

Reduced conference fees for Affiliates

Organizers of the following conferences have agreed to a 10 per cent reduction in Conference fees for Affiliates:

- 2nd International Symposium on Quantitative Luminescence Spectroscopy in Biomedical Sciences (Ghent, Belgium, 11–14 May 1987)
- 2nd International Workshop on Behavior of Pollutants in Porous Media (Bet Dagan, Israel, 14–19 June 1987)
- 6th International Meeting on Boron Chemistry (Bechyně, Czechoslovakia, 22–26 June 1987)
- 31st International Symposium on Macromolecules (Merseburg, GDR, 30 June–4 July 1987)
- International Conference on Heteroatom Chemistry (ICHAC-1987) (Kobe, Japan, 19–24 July 1987)
- 9th International Conference on Chemical Education. Sub-title: 'Chemistry for our New World' (São Paulo, Brazil, 26–31 July 1987)
- 25th International Conference on Coordination Chemistry (Nanjing, China, 26–31 July 1987)
- 8th International Conference on Solute–Solute–Solvent Interactions (Regensburg, FRG, 9–14 August 1987)
- World Congress of Theoretical Organic Chemists (Budapest, Hungary, 12–19 August 1987)
- 2nd Nordic Symposium on Trace Elements in Human Health & Disease (Odense, Denmark, 17–21 August 1987)

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan.
(Dr T. Yoshida, The University of Tokyo, Department of Metallurgy and Materials Science, Faculty of Engineering, Bunkyo-ku, Tokyo 113, Japan.)

Vapor–Liquid Equilibria

9–10 September. 3rd International Workshop on Vapor–Liquid Equilibria in 1-Alkanol + *n*-Alkane Mixtures. Budapest, Hungary.
(Dr H. V. Kehiaian, Laboratoire de Chimie Organique Physique, Institut de Topologie et de Dynamique des Systèmes, Université Paris VII — C.N.R.S., 1 rue Guy de la Brosese, F-75005 Paris, France.)

CHEMRAWN IV

4–9 October. "Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources". Colorado, USA.
(Dr Derek W. Spencer, Associate Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1-5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubère, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-les-Nancy Cédex, France.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslavak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Poly(Vinyl Chloride)

18–21 July. 31st Microsymposium on Macromolecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(Dr P. Čefelín, Deputy Director, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto 606, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Natori, Maiji College of Pharmacy, 1-22-1, Yatocho, Tanashi-shi, Tokyo 188, Japan.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena, Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Department of Chemistry, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

Coordination Chemistry

29 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. J. de O. Cabral, Department of Chemistry, Faculdade de Ciencias, 4000 Porto, Portugal.)

1989

IUPAC CONGRESS

2–7 August. 32nd International Congress of Pure and Applied Chemistry. Stockholm, Sweden.
(Dr Bengt Karlsson, The Swedish Chemical Society, Wallingatan 26A, 5-111 24 Stockholm, Sweden.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds, Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Dept. of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

1990

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

Compendium of Chemical Terminology: IUPAC Recommendations

Available in both Hardback and Paperback

(The late) **V. Gold** formerly of King's College, London; **K.L. Loening,** Chemical Abstracts Service, Columbus, Ohio; **A.D. McNaught,** and **Pamil Sehmi,** both of the Royal Society of Chemistry, London

Published on behalf of the
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY
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IUPAC

The credit for initiating this project lies entirely with the late **Victor Gold**, a Member of the IUPAC Interdivisional Committee on Nomenclature and Symbols (IDCNS). Owing to the availability of only limited resources, the original conception involved three stages, to be carried out under the auspices of IDCNS:

(a) identification of IUPAC documents containing suitable definitions,
(b) construction of an alphabetical listing of the terms defined with references,
(c) compilation of the present **Compendium**, involving editing and harmonization of material from different sources.

Victor Gold was able to complete only the first two stages and to begin the third before his untimely death on 29th September, 1985. The project was then completed by **Kurt Loening** and **Alan McNaught** with the support of the Royal Society of Chemistry. The compilation of entries was carred out by **Pamil Sehmi**, first at King's College, London, and then at the premises of the Royal Society of Chemistry.

This *Compendium* is then an alphabetical listing of terms used in chemistry, with the definitions recommended by various IUPAC commissions dealing with nomenclature and terminology. Terms from physical, inorganic, organic, macromolecular, and analytical chemistry published up to the end of 1985 are included. The book differs from other chemical dictionaries in that the definitions are truly authoritative, being recommendations agreed by committees of experts after consultation with the chemical community; it is intended to be ongoing as some important areas of chemistry have not yet been the subject of IUPAC recommendations and thus is therefore the first step towards a comprehensive and authoritative chemical dictionary. Available in both hardback and paperback.

Outline of Contents:

Alphabetical entries; References; Source documents.

Early 1987. 464 pages. Cloth £45.00, Limp £29.50.

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Quantities, Units and Symbols in Physical Chemistry

Compiled for the Commission of Physicochemical Symbols, Terminology, and Units, Physical Chemistry Division, International Union of Pure and Applied Chemistry, by K.Homann, Darmstadt.

Published on behalf of the
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY
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Based on the more comprehensive IUPAC document **Quantities, Units and Symbols in Physical Chemistry,** to be published later this year, this laminated list is intended as a ready reference to the symbols most frequently used by authors, teachers and students in chemistry and related disciplines. It is an invaluable information source on the internationally recommended symbols for the most important physical quantities and units used by chemists and includes such subjects as: base SI units and physical quantities, SI prefixes, SI derived units with special names and symbols, recommended symbols for commonly used physical quantities, units outside the SI and values of some fundamental constants.

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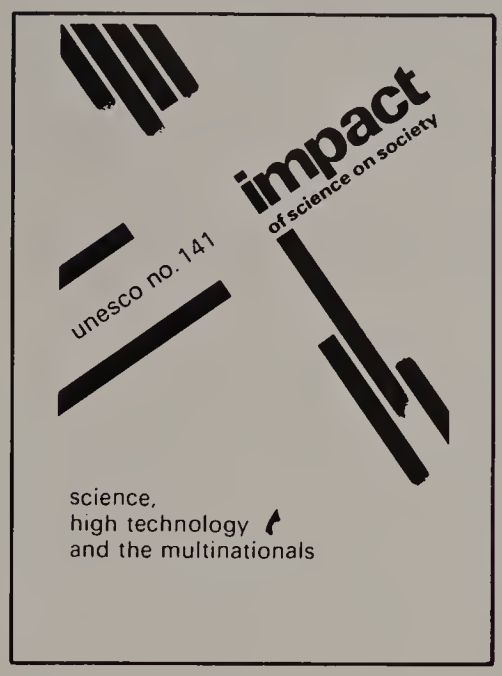

EDITOR
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Analytical Chemistry in the Exploration, Mining and Processing of Minerals

Edited by **L.R.P. Butler**

Analytical chemistry is extremely important for the mineral industry, as it is a research method used not only in the exploration and exploitation of mineral deposits, but also in the processing of materials. This volume contains the invited lectures presented at the *2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials* which was held in South Africa in 1985. The aim of the symposium was to highlight the importance of analytical chemistry in the production of materials, such as coal, ferrous and non-ferrous metals, ceramics and precious metals, from the initial stages of exploration and assessment of ores to their beneficiation and, finally, to the refined product. This volume will be equally valuable to anyone working in fields related to the quality of materials, such as analytical chemists, mineral physicists, metallurgists, geologists, and chemical and mining engineers.

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Wet chemistry
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Analysis of ceramic materials
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International Union of Pure and Applied Chemistry (IUPAC)

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

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Academy of Scientific Research and Technology **(Arab Republic of Egypt)**
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Chemistry International

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Front cover: Standard reference materials (see p. 142).

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News & Views

Affiliates in over 70 countries

The number of Affiliates and number of countries involved in the IUPAC Affiliate Membership Scheme has increased substantially in 1987. At the time of writing (25 March 1987) almost 6700 Affiliates from 68 countries had registered as Affiliates. Another five countries have agreed to implement the scheme this year. These are marked with an asterisk (*) on the list below. The overall total to date shows a 20% increase compared with last year.

The increasing number of chemists from Third World countries registering as Affiliates is particularly encouraging. So far chemists from almost 40 Third World countries are now enrolled. Many of these have been sponsored by the United Nations Educational, Scientific and Cultural Organization (Unesco) and the International Council of Scientific Unions (ICSU).

Number of Affiliates in 1986 and 1987 (to date)

Country	1986	1987
Algeria	2	3
Argentina	43	30
Austria	—	2
*Bangladesh	—	—
Belgium	—	1
Botswana	—	1
Brazil	20	21
*Bulgaria	—	—
Canada	—	2
Chile	16	—
China/Beijing	21	24
China/Taiwan	—	4
Colombia	10	—
Cyprus	—	1
Czechoslovakia	—	229
Denmark	15	26
Egypt	—	25
Ethiopia	10	35
Federal Republic of Germany	37	41
Fiji Islands	—	1
France	1	102
Ghana	6	24
Hungary	10	10
India	20	—
Indonesia	—	1
Ireland	5	—
Italy	—	95
Jamaica	1	1
Japan	323	—
Jordan	1	2
Kenya	17	1
*Kuwait	—	—
Lebanon	1	—
Libya	—	1
Luxembourg	—	1
Malawi	—	25
Malaysia	66	62
Malta	—	1
Mexico	1	—
Nepal	—	1
Netherlands	—	20
New Zealand	20	22
Nigeria	1	1
Pakistan	—	1
Panama	—	31
Papua New Guinea	24	—
Peru	—	33
Philippines	10	21
*Poland	—	—
Portugal	—	6
Republic of Korea	15	—
Republic of South Africa	—	240
Romania	—	1
Rwanda	—	25
Saudi Arabia	1	2
Singapore	29	33
Spain	—	1
Solomon Islands	1	—
Sri Lanka	9	22
Sweden	6	10
Switzerland	3	10
Tanzania	1	—
Thailand	10	—
Trinidad	—	1
Turkey	58	81
UK	328	393
Uruguay	9	—
USA	4412	4932
Venezuela	—	1
Vietnam	—	1
*USSR	—	—
Yugoslavia	1	1
Zambia	1	—
Zimbabwe	—	3
Total	5565	6681

Proposed meeting for editors, 1989

In 1981, the IUPAC Congress in Vancouver included a one-day meeting for editors of chemistry journals. It consisted of lectures from four full-time editors and information specialists and, most important, plenty of time for discussion. The object of the exercise was to enable editors, especially those whose editorial activities are part-time, to learn about recent developments in chemical publishing, nomenclature, and related subjects, and to discuss them with their peers.

It has been suggested that a similar meeting should be held in 1989 in association with the IUPAC Congress (Stockholm, Sweden, 2–7 August 1989). Dr I. A. Williams, Chairman of the IUPAC Committee on Publications, has been asked by the Committee to contact as many editors as possible and to ask them:

- whether they think the idea of such a meeting is a good one;
- whether they would be likely to attend;
- whether they would be prepared to speak at the meeting, and if so, on what subject;
- whether they have any suggestions for topics which they would particularly wish to be covered by the speakers.

Dr Williams would be most grateful if he could receive views from chemistry editors. They should be sent to: Dr I. A. Williams, Royal Society of Chemistry, Burlington House, Piccadilly, London W1V 0BN, UK.

Letters to The Editor

IUPACronyms

Sir,

I had hoped that, by your masterly use of the "deliberate mistake" technique (*CI*, Vol. 7, No. 4, p. 1, 1985) and its clarification (*CI*, Vol. 7, No. 5, p. 6, 1985), the difference between an abbreviation and an acronym would now be clear. You can imagine my horror, therefore, when I recently had the opportunity to browse through Vol. 8 of *CI*, to find (*CI*, Vol. 8, No. 2, p. 7, 1986) that IDCNS itself appeared to be confusing acronyms and abbreviations and, perhaps even worse, a report (*CI*, Vol. 8, No. 2, p. 24, 1986) that a paper in *Chemistry Education* was doing exactly the same thing. Even Dr Keattch (*CI*, Vol. 8, No. 4, p. 4, 1986) marred an otherwise admirable letter by inferring that some part of the extraordinary address he quoted could be an acronym.

Quite apart from misuse of the term in English there is possibly another difficulty in the international context, language. For example, the abbreviation SI (from Système Internationale d'Unités) is a French word formed from the abbreviation of other French words and, therefore, fulfils the requirements of an acronym in French, it may be an acronym in Spanish but it certainly is not one in English. Is NAO, an abbreviation in English for three English words, an acronym in Portuguese? There are probably better examples that linguists might know about and there may be a philologist amongst your readers who could answer the language questions, but would it not be prudent, in view of the uncertainty and misuse, each of which is surely anathema in IUPAC, to ban the use of the term acronym in IUPAC publications?

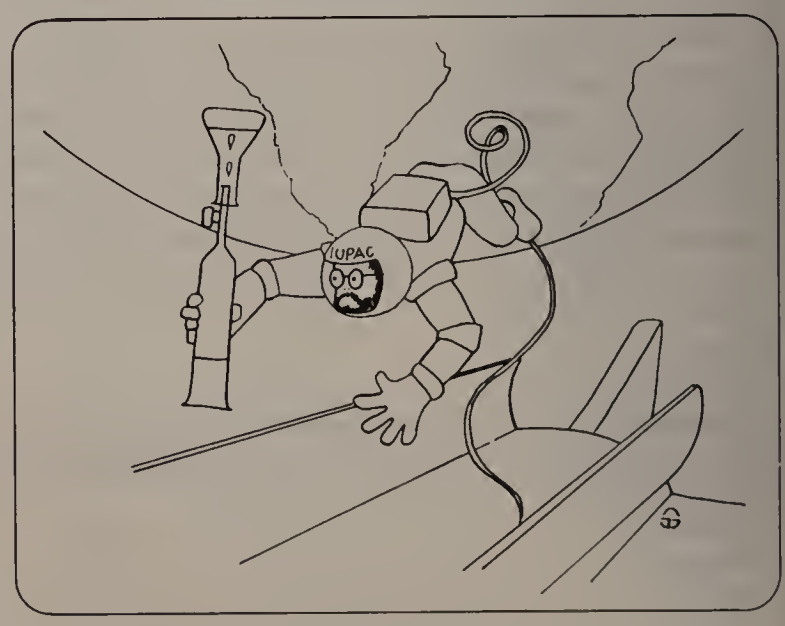
This brings me to the alternative title of IUPAC. As a matter of historical interest, when I was first associated with the Union in 1963 the alternative PAC part was Paper, Agenda and Confusion — attributed to one of my then Division V colleagues, Prof. W. Fischer. If we must now have an update, please let it be Paper, Abbreviations and Confusion, thereby reducing the confusion just a little.

Roger W. Fennell
Formerly, *inter alia*, Commission V3

Congress of Pesticide Chemistry

Congratulations to Mike Freemantle on the coverage of the 6th IUPAC Congress of Pesticide Chemistry in Ottawa! It was a masterful piece of journalism in both scope and comprehension of the diverse topics presented at the Congress. I particularly enjoyed the photos, especially of our growing number of chemists attending Congresses from Third World countries. Well done, Mike!

Philip C. Kearney,
President, Applied Chemistry Division



Nine out of 53

Prof. Gottfried Kempe, author of "Tertiary level chemical education in the GDR" (*CI*, Vol. 9, No. 2, p. 50, 1987) has brought to our attention an editorial error in his paper. The second sentence in the second paragraph read: "Each year about 500 students are enrolled on chemistry courses at the nine universities and technical universities in the country." The sentence implies that there are only nine universities and technical universities in the GDR. This is incorrect. There are, in fact, 53 universities in the country. Our apologies to Prof. Kempe.

IUPAC People

Loening receives Patterson–Crane Award

Dr Kurt Loening, Chairman of the Interdivisional Committee on Nomenclature and Symbols (IDCNS), has won the 1987 Patterson–Crane Award of the American Chemical Society's Columbus and Dayton Sections.

The Patterson–Crane Awards are made for contributions in the field of chemical literature, especially in the documentation of chemistry, chemical information storage and retrieval, and implementing and managing chemical information services.

Loening is Nomenclature Director of the ACS Chemical Abstracts Service at Columbus, Ohio. He has been closely involved in IUPAC activities for over two decades. In 1965 he was appointed to membership of IUPAC's Commission on Nomenclature of Organic Chemistry (CNOC) and served on this Commission until 1980. He was appointed Chairman of the newly created Commission on Macromolecular Nomenclature in 1968 and served thereon continuously until 1985. In addition, he was a member of the IUB–IUPAC Joint Commission on Biochemical Nomenclature during the period 1977–85.

Dr Loening, Chairman of IDCNS.

Loening became a member of IDCNS in 1969 and since 1976 has been its Chairman. He is particularly associated with introducing in 1984 the revised procedure for comment and approval of IUPAC recommendations on nomenclature and symbols. Furthermore, he was responsible with the late Prof. V. Gold for initiating preparation of the *Compendium of IUPAC Terminology* which has recently been published.

We regret to record the death of:

Mr S. G. Brooker, New Zealand (22 October 1986) — Commission on Oils and Fats (1969–75).

Prof. W. Th. Nauta, Netherlands (6 December 1986) — Commission on Medicinal Chemistry (1975–83).

Address changes

Prof. Irine P. Beletskaya (Secretary, Organic Chemistry Division Committee): Faculty of Chemistry, Lomonosov Moscow State University, Leninskie Gory, SU-119899, GSP-3, Moscow, V-234, USSR.

Prof. P. W. Gilles (Secretary, Commission on High Temperature and Solid State Chemistry): Telex: 535004 DEPT PHYS ASTR.

Dr T. R. Roberts (Secretary, Commission on Pesticide Chemistry): Tel: +44 (795) 412285.

Prof. T. S. West (Secretary General): Macaulay Institute, Craigiebuckler, Aberdeen AB9 2QJ, UK. Telex: 738847 MLURI G. Fax: + 44 (224) 311556.

New telex number for IUPAC Secretariat

The IUPAC Secretariat now has the following telex number: 83220 IUPAC G.

Dr John V. Kingston of the Division of Scientific Research and Higher Education, UNESCO, who recently visited the IUPAC Secretariat in Oxford for discussions.

Latha Menon, Production Editor of *CI* for the past two years, who is leaving to have a baby.

Cam Appleby, the new Production Editor of *CI*.

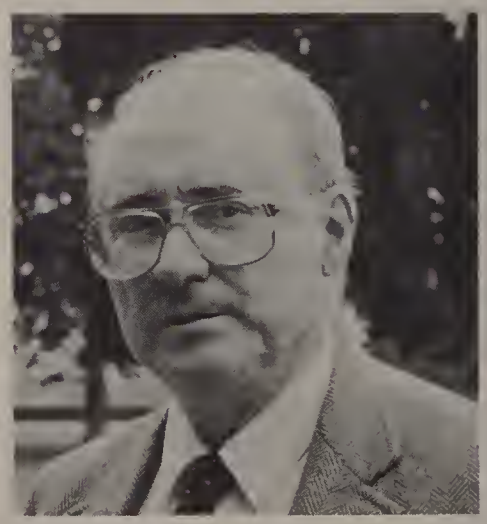
Who's who in IUPAC

A pen portrait of Dr David R. Lide, President of the Physical Chemistry Division

Dr David R. Lide has been involved with IUPAC since 1971 and is currently President of the Physical Chemistry Division. He was born in Gainsville, Georgia, USA, in 1928 and obtained a PhD in Chemical Physics from Harvard in 1952. Most of his career has been spent at the National Bureau of Standards in Washington.

His research has covered a number of topics in molecular structure and spectroscopy. He employed microwave spectroscopy for studying hindered internal rotation, free radicals, high-temperature species, and precise structures of polyatomic molecules. Other work was carried out on infrared lasers and molecular force fields. Lide has published close to 100 papers and review articles in these areas. He directed the Molecular Spectroscopy Division of the National Bureau of Standards (NBS) from 1963 to 1969.

Since 1969, Lide has headed the Standard Reference Data program at the National Bureau of Standards. This is a national program aimed at producing critical data compilations of physical and chemical properties. The participants include scientists at NBS, universities, and industrial laboratories. In this capacity he established the



Dr David Lide at the ICSU General Assembly, Berne, Switzerland, September 1986.

Journal of Physical and Chemical Reference Data, which is jointly published by the American Chemical Society and the American Institute of Physics, and he still serves as Editor.

In addition to his work at NBS, Lide has held fellowships at Oxford, University College London, and the University of Bologna. He is also active in scientific societies, having served on the Council of the American Physical Society, the Petroleum Research Fund Advisory Board and Chemical Abstracts Advisory Board (American Chemical Society), and various committees of the American Institute of Physics (AIP), including a term as Chairman of the AIP Publication Board.

One of his major international activities has involved the ICSU Committee on Data for Science and Technology (CODATA). He has been active in CODATA since its early days, serving as the United States Delegate for eight years before being elected Secretary General in 1982. At the 15th CODATA General Assembly in July 1986 he was elected President for 1986–1990 (see *CI*, Vol. 8, No. 6, p. 1, 1986).

Lide's service in IUPAC began with his election as a Titular Member of the Commission on Symbols, Terminology, and Units in 1971. He was Chairman of this Commission from 1977 to 1981. He was then elected Vice-President of the Physical Chemistry Division and became President in 1983. He now acts as Chairman of the Group of Division Presidents. He has also served on IDCNS and on Subcommittees of the Commission on Molecular Structure and Spectroscopy. He took part in the Studies of the IUPAC role in computerized databases and became the first Chairman of the Committee on Chemical Databases when it was established by Council in 1985.

The Chinese Chemical Society, Beijing

In August 1932, 45 chemists from Beijing, Tianjin, Shanghai, Jiangsu, Zhejiang, Anhui, Henan, Guangdong, Guangxi, Hunan, Hubei and 7 other cities and provinces in China met in Nanjing at a conference convened by the Ministry of Education to discuss Chinese chemical terminology, chemistry for national defence and chemistry teaching. They decided to set up a national chemistry organization.

The Chinese Chemical Society (CCS) is one of the oldest academic societies in China and one of its largest physical science organizations. Since its formation, CCS has promoted a wide range of academic activities, sponsored the publication of several chemical journals and played a role as an academic organization.

The development of CCS

CCS is a major academic organization of Chinese chemists based on voluntary participation. It aims to unite Chinese chemists at home and abroad in common efforts for developing chemistry in the country. The composition of the leading body of CCS is determined by election. Sixteen boards of directors have been elected from the founding of CCS in 1932 to the establishment of the People's Republic in 1948. The total number of members has increased from 45 at the start to more than 3000 during the same period.

"CCS . . . aims to unite Chinese chemists at home and abroad in common efforts for developing chemistry in the country."

CCS was given a new lease of life after 1948. In December 1950, CCS held a meeting in Beijing at which the chairman and 21 members of the board were elected.

In August 1951, the First National Conference of the society was held. It adopted a new constitution and elected the 17th Board with Hou Debang as chairman, and eight others as members of the standing committee. The Second National Conference took place in August 1956. The 18th Board of 47 members, with Yang Shixian as chairman, and six others as members of the standing committee were elected. CCS merged with the Chinese Chemical Engineering Society in June 1959 to become the Chinese Chemical and Chemical Engineering Society. The 19th Board of 83 members was elected, with Hou Debang as chairman that year. In 1963, the two societies split up into two separate organizations.

In August of the same year, the Third National Conference of the Chinese Chemical Society was held in Qingdao. It revised the CCS Constitution and elected the 20th Board of 57 members, including 19 members of the standing committee, with Yang Shixian as chairman. Five specialized divisions: inorganic chemistry, analytical chemistry, physical chemistry, organic chemistry and polymer chemistry together with a scientific dissemination working committee were set up to promote academic activities in these fields and accelerate the spread of chemical knowledge. By that time, CCS membership had expanded to some 6000.

An annual meeting of historic significance was held in Shanghai in September 1978. It elected 155 board members including 31 standing committee members and seven more vice-chairmen to form the 20th Board. In April 1979 and 1980, board meetings were held to revise the CCS constitution, set up specialized divisions and committees and draw up plans and programmes for regular and academic work.

To celebrate its 50th anniversary, CCS held a commemorative academic meeting and the 4th Na-

Chairman of the 22nd CCS Board of Directors

Top left: Prof. Tang Youqi, Chairman 1986–87; top centre: Prof. Tian Zhaowu, Chairman 1987–88; top right: Prof. Xu Guangxian, Chairman 1989–90. Bottom: Prof. Huang Weiyuan, Chairman 1988–89, at the IUPAC Bureau meeting held in Oxford, UK, September 1986 (from left: Prof. H. Gg. Wagner, FRG; Profs S. Itô and T. Saegusa, Japan; Prof. Huang Weiyuan.

tional Conference in September 1982 in its birthplace, Nanjing, in order to promote international and domestic academic exchanges and elect a new leading body. The Conference elected the 21st Board of Directors (1982–1986). This consisted of 139 board members including 25 standing committee members. Lu Jiaxi, Yan Dongsheng, Tang Aoqing and Qian Renyuan were elected chairmen. Each was executive chairman for one year.

The 5th National Conference of CCS took place in April 1985. The 22nd Board of Directors for the period September 1986–September 1990, consisting of 139 board members including 29 standing committee members were elected. Tang Youqi (Peking University), Tian Zhaowu (Xiamen University), Huang Weiyuan (Shanghai Institute of Organic Chemistry, Academia Sinica), and Xu Guangxian (Peking University) were elected chairmen for the four-year period.

At present CCS has 12 divisions and five working committees:

Divisions
Inorganic Chemistry
Analytical Chemistry
Physical Chemistry
Organic Chemistry
Polymers
Nuclear and Radio-Chemistry
Chromatography
Rheology
Applied Chemistry
Catalysis
Crystallography
Chemical Education

Working Committees
Dissemination of Chemical Knowledge
Publications
Foundation
International Exchange
Chemical Terminology Editing Committee

The CCS board of directors is serviced by the staff of a general office. Since 1979, CCS has also published a national chemistry magazine.

After the restoration of CCS in 1977, its local branches were restored or set up. All the provinces, municipalities and autonomous regions except Tibet now have chemical (or chemical and chemical engineering) societies with a total of approximately 50 000 individual members, 43 organization members and some foreign correspondent members.

Principal academic activities

One of the tasks of CCS is to organize academic activities. From its inauguration in 1932 to the formation of the People's Republic of China in 1948, the CCS held a total of 15 annual meetings with a total attendance of some 1700 participants. Main items on the agenda of the meetings included reading of scientific papers, reports on the proceedings of CCS, election of the boards of directors and the organization of visits. More than 500 papers were read. These reflected China's achievements in chemistry between the early 1930s and the late 1940s.

"CCS members . . . played an important role in China's industrial development . . ."

It is noteworthy that, while carrying on chemical research and teaching in the interior areas, CCS members took an active part in founding China's chemical industry during the war with Japan. They also played an important role in China's industrial development working in the production of alcohol, fuel, acids, alkalis, iron, steel and other metals, leather, papermaking, dyestuff, ceramics and the pharmaceutical industries.

Since 1948, while continuing to hold national conferences and annual meetings, CCS has promoted a wide range of activities to meet national needs and the development of chemical science. These have included:

- Research on defence against bacteriological warfare in 1952
- Seminars on the structure of organic compounds and on chemistry teaching in 1953
- Commemorative meeting on the 120th anniversary of Professor Mendeleev's birth
- Forum on Chinese chemical history
- High polymer chemistry symposium (held jointly with the Chinese Academy of Sciences) in 1954
- Symposium on Analytical Chemistry in 1955

In June 1960, after its amalgamation with the Chinese Chemical Engineering Society, CCS held an annual meeting to discuss questions of common concern in the technical innovation movement. During the years 1951–63, CCS organized eight sizable academic activities closely related to national construction. All its work, however, was suspended during the 10-year period of the "Cultural Revolution".

Headquarters of the Chinese Chemical Society (CCS) in Beijing.

The CCS resumed its activities after 1977. The 20th annual meeting was held in Shanghai in September 1978. In the interval between the 20th annual meeting and the end of 1981, CCS held a total of 30 academic gatherings with a total attendance of 4500. As many as 3100 research papers have been read at the academic symposia since 1978. This is more than six times the number of papers read at the annual meetings held before 1948. Academic activities have increased even more since 1983. From 1983 to 1985, 54 academic meetings were sponsored by CCS with a total attendance of more than 8000 and approximately 7000 scientific papers.

In order to strengthen international academic exchanges, CCS joined IUPAC in 1979. Since 1980, CCS delegations have attended every IUPAC Congress and General Assembly. In the 33rd General Assembly in 1985, Prof. Huang Weiyuan, Director of The Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, was elected bureau member (see *CI*, Vol. 7, No. 6, p. 9, 1985). In the previous General Assembly held in 1983, Prof. Zhang Qinglian of Peking University was elected Titular Member of the Commission on Atomic Weights and Abundance of Isotopes of the Inorganic Division. At the moment, 14 CCS members are members of, or national representatives on, IUPAC bodies.

In 1984, CCS joined The Federation of Asian Chemical Societies (FACS). Seven members of CCS became the members of different working groups and of The Asian Network on Analytical and Inorganic Chemistry. In 1989, the Asian Chemical Congress and the 5th General Assembly of FACS will be held in China.

In the last three years, the number of foreign scientists visiting China has increased tremendously. Many foreign scientists have attended national conferences and international symposia organized by CCS.

Nonname Lake in Peking University.

From 1983 to 1985, CCS entertained 310 foreign scientists and cosponsored with IUPAC the International Symposium on Organic Chemistry of Medicinal Products (see *CI*, Vol. 8, No. 4, pp. 2–3, 1986). Four hundred and twenty-two scientists attended this symposium and 332 scientific papers were presented. Further international symposia sponsored or cosponsored by CCS are planned for 1987. They include the International Conference on Coordination Chemistry and the 8th International Conference on Computers in Chemical Research and Education.

Chemical education

From its inception, CCS has paid constant attention to chemical education and the dissemination of chemical knowledge. Its leaders have on many occasions called attention to and made specific arrangements for work in these two respects. They have also made positive contributions to enhancing the scientific and cultural level of the whole nation.

CCS has done a great deal with regard to the nomenclature of chemical terms. In 1953, the Chinese Academy of Sciences (Academia Sinica) called an enlarged meeting on the nomenclature of chemical substances. It was chaired in rotation by CCS leaders. Books on Chinese chemical terminology were edited and published. Scientists of the various subdisciplines have constantly supplemented and revised nomenclature thus contributing to the unification of chemical terms in China.

CCS also attaches much importance to chemical education, and among its leaders there are many prestigious professors and scholars who, while actively engaging in teaching or research, have done much to help promote chemical education in China.

In order to improve the level of chemical education, CCS has in recent years founded the journal *Chemical Education* and held two meetings to compare notes on the teaching of chemistry at university and secondary school levels. The running of specialized study sessions is an excellent way to train talented people, spread chemical knowledge and popularize new technologies. Since the summer of 1980, CCS has sponsored many such courses.

Research work in a Beijing chemical laboratory.

Other CCS activities include:

- Editing books in its chemical knowledge series
- Planning chemical educational films
- Editing scenarios
- Guiding secondary school students' chemistry contests
- Arranging for school educational visits to chemical research institutions
- Organizing popular chemistry lectures
- Providing a consultative service
- Receiving visitors and answering enquiries

Since 1984, the CCS central TV station and the daily newspaper *China Youth* have jointly sponsored biennial National Chemistry Contests for secondary school students and "Summer Camping" activities which are warmly welcomed by young students. In 1985, CCS also sponsored an exhibition on chemistry research and the interchange of chemists. Eighty thousand people visited the exhibition.

Finally, the Chinese Chemical Society has also sponsored two awards. The first is an award for the most promising chemist under the age of 35 years. The second is the Professor Wang Baoren's Award for important contributions to fundamental research in polymer science.

Chemistry journals

CCS has always regarded publication of academic journals as one its major tasks. The first board meeting held in August 1932 after the founding of the CCS decided to publish the *Journal of the CCS*. This was followed by the founding of the magazines *Chemistry* and *Chemical News*.

- The *Journal of the CCS* was founded in 1933. It publishes research papers from all parts of China. To strengthen international exchanges, the papers were published in foreign languages until the 1948 period. Starting with Vol. 19 (1952), the magazine was renamed *Acta Chimica Sinica* and published in Chinese with English abstracts and in English. Its publication was suspended after No. 3 of Vol. 32, and republished as a quarterly in 1957. It changed to a bimonthly in 1980 and then back to monthly in 1982. So far 44 volumes have been published. The journal is distributed both at home and abroad. Its editorial board, based in the Shanghai Institute of Organic Chemistry of the Chinese Academy of Sciences, consists of an editorial committee of 65 chemists, with Wang You as editor-in-chief.
- *Huaxue Chemistry*, founded in 1934, covers progress in chemical research, teaching methods, general surveys of China's chemical industry, abstracts of research papers, news of chemistry publications, and the proceedings of CCS. A total of 27 issues in 11 volumes were published before Liberation. The magazine was renamed *Huaxue Tongbao (Chemistry)* in 1952, when it was published as an academic monthly of intermediate level. Its present editorial board, based in the Institute of Chemistry of the Chinese Academy of Sciences in Beijing, consists of an editorial board of 60 chemists with Hu Yadong as editor-in-chief.

• The *Chemical Newsletter*, founded in 1936, reports mainly on CCS activities in order to strengthen ties between the CCS and its members. It was first published fortnightly and then irregularly. Its publication was suspended in 1949 after Vol. 14, and resumed in 1985. The editor-in-chief is Cui Mengyuan. *The address of the editorial office is The Chinese Chemical Society, PO Box 2709, Beijing, China.*
• In addition to the aforementioned magazines, CCS has published, since 1948

Chinese Versions of Important Foreign Chemistry Papers
Polymer Communications
Analytical Chemistry
Inorganic Chemistry
Acta Physico-Chimica Sinica
Organic Chemistry
Chinese Journal of Chromatography
University Chemistry
Chemical Education

• *Chinese Versions of Important Foreign Chemistry Papers*, is devoted mainly to translations of the research findings of the Soviet Union and other countries and reviews and articles of synthetic studies. It was founded in 1955 with Tang Youqi as editor-in-chief and lasted until 1959.
• *Polymer Communications* was founded in 1952. In 1979 it became a bimonthly and was divided into Chinese and English editions in 1983. There are different papers in each edition. Their editorial boards, based in the Institute of Chemistry of Chinese Academy of Sciences in Beijing, consist of an editorial committee of 31 polymer chemists for the Chinese edition and 10 for the English edition. Wang Baoren is editor-in-chief.
• *Analytical Chemistry*, founded in 1973 by the Changchun Institute of Applied Chemistry of the Chinese Academy of Sciences, has been run by CCS as a monthly since 1979. Its editorial board, based in the Changchun Institute of Applied Chemistry, consists of an editorial committee of 63 analytical chemists with Chen Qi as editor-in-chief.
• The bimonthly journal entitled *Chemical Education* has its editorial board based in the Department of Chemistry of the Beijing Normal University. The board consists of 45 chemistry professors and teachers. Its editor-in-chief is Chen Guangxu.

The Great Wall in Beijing.

International Symposium on Molecular Structure. 125 Foreign chemists — including three Nobel Laureates: Profs D. C. Hodgkin, W. N. Lipscomb and H. Hauptman — and more than 130 Chinese chemists attended this meeting, held in Beijing, 15–21 September 1986.

CCS which has set up a chemistry Magazine Editorial Board is also responsible for publishing books, such as *Raman Frequency Characteristics of Organic Compounds, Infrared Absorption Spectra* and other translated works which fill the needs of the short courses sponsored by CCS.
• At irregular intervals since 1979, CCS has published over 40 issues of *The CCS Bulletin*. These report on CCS activities.
• *Organic Chemistry*, first published in 1980 and sponsored by CCS in 1984, is a bimonthly journal with Huang Yaozeng as the editor-in-chief and an editorial board of 49. It is based in Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences.
• The bimonthly journal, *Acta Physico-Chimica Sinica* was founded in 1985 with Tang Youqi as editor-in-chief and an editorial board of 43. It is based in the Chemistry Department, Peking University.
• *The Chinese Journal of Chromatography*, founded in 1984 with an editorial board of 30 and Lu Peizhang as the editor-in-chief, is based in Dalin Institute of Chemical Physics.
• *Inorganic Chemistry*, founded in 1985 with Dai Anbang as editor-in-chief and an editorial board of 30 has its editorial office situated in the Chemistry Department of Nanjing University.
• *University Chemistry* started publication in 1986 with Hua Tongwen as the editor-in-chief. Its office is situated in the Chemistry Department, Peking University.

At present, CCS publishes a total of 10 scientific periodicals, which are well known among chemistry circles at home and abroad. They play a role in promoting academic exchanges, spreading chemical knowledge and training qualified chemical personnel.

The address of the secretariat of the Chinese Chemical Society is PO Box 2709, Beijing, China.

Online chemical information

Stephen R. Heller

In 1985, IUPAC established a Committee on Chemical Databases (CCDB). This article by CCDB Secretary/Coordinator Stephen Heller provides a brief summary of the chemical information available online in computer systems around the world. It includes a description and discussion of both databases and software systems.

Introduction

In 1985, IUPAC created a Committee on Chemical Databases, with members from FRG, Japan, USA and USSR. The Committee has three main terms of reference.

The first is to advise the IUPAC President and Executive Committee on all aspects of computerized databases of chemical properties, needs for standardization for databases and chemical structure records, and policy on databases dissemination. The second is to work with IUPAC Commissions on the design and implementation of databases and appropriate software and to encourage maximum compatibility of databases from different groups within IUPAC. Lastly the Committee is to promote, in collaboration with other ICSU bodies, a higher level of awareness of the application of computers in the management, dissemination, and use of chemical data.

". . . the activities of the Committee should attract a growing and interested audience throughout IUPAC."

This article on Online Chemical Information has been prepared as part of the third activity and is the first educational activity of the Committee. The Committee is also working on a *Glossary of Computer Terms* for chemists, guidelines for factual database design, and is preparing a draft list of chemical codes for IUPAC (including Greek letters and other special symbols), which would be the computer equivalent of the IUPAC "Green Book" *Quantities, Units and Symbols in Physical Chemistry* (see *CI*, Vol. 9, No. 2, p. 71, 1987). With the heightened awareness of the need for and use of computers as a tool to aid chemists, the activities of the Committee should attract a growing and interested audience throughout IUPAC.

Chemical literature was once a finite and manageable resource. However, with the information explosion it has become almost infinite and unmanageable. Nowadays a chemist has difficulty keeping abreast of latest developments in a given area of research. This problem has been recognized by the scientific information community, mostly notably with *Chemical Abstracts*, and over the past twenty years has led to considerable automation of chemical information and data. The existence and availability of online information now makes it possible for anyone, anywhere in the world, in both big and small organizations, to have the same access to information at the same time and at (esssentially) the same cost.

Author Stephen Heller sitting at a computer terminal connected to a chemical database system via an ordinary telephone line which can be seen at the bottom left-hand side of the picture. Heller is Research Leader, Model and Database Coordination Laboratory, Agricultural Research Service, US Department of Agriculture, Beltsville, Maryland, USA.

There are many books[1] and articles on chemical information and computerized databases. This brief article surveys the field in order to inform the reader of the availability and major features and characteristics of products and services on the market.

Types of chemical information

A number of types of chemical information have been automated or computerized, and it is important to know and understand the differences between these types.

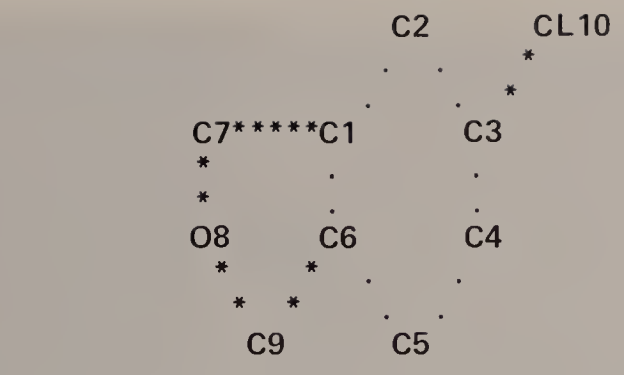
First is reference data, often called bibliographic chemical data. This includes *Chemical Abstracts*, which publishes some 400 000 abstracts per year, as well as the Institute for Scientific Information (ISI) *Index Chemicus*, which publishes a similar number of abstracts. These databases contain textual information, citations, sometimes abstracts, but not factual data.

The second type of chemical database is called non-bibliographic, factual, source or numeric data. These databases contain actual numbers or measurements, like mass spectral data, infrared data, boiling points, partition coefficient values, and so forth.

Handbooks and similar types of databases, such as Beilstein — *The Handbook of Organic Chemistry*, Heilbron — *The Dictionary of Organic Chemicals, The Cambridge Crystal Database, The Merck Index*, are examples of databases which fit into this category.

In chemistry there is a third type of database which is related to, and a necessary companion to the other two. This is the chemical structure database. This is a database in which chemical structures have been represented in computer readable form, usually as connection tables. A simple example of a connection table is shown in the figure.

There have been many other representations of chemical structures, including IUPAC nomenclature and Wiswesser Line Notation (WLN). A connection table differs from these linear notations (i.e. notations which can be written on one line) in its two-dimensional nature. It also allows the opportunity to search for chemical fragments or sub-structures in a completely open and total manner. It is worth noting that structure searching by name fragments using WLN is also possible. However, it is not as good, efficient and complete as connection table searching.



1	C	2	6	7	0	0	0	9	9	1	0	0	0
2	C	1	3	0	0	0	0	9	9	0	0	0	0
3	C	2	4	10	0	0	0	9	9	5	0	0	0
4	C	3	5	0	0	0	0	9	9	0	0	0	0
5	C	4	6	0	0	0	0	9	9	0	0	0	0
6	C	1	5	9	0	0	0	9	9	1	0	0	0
7	C	1	8	0	0	0	0	1	1	0	0	0	0
8	O	7	9	0	0	0	0	1	1	0	0	0	0
9	C	6	8	0	0	0	0	1	1	0	0	0	0
10	CL	3	0	0	0	0	0	5	0	0	0	0	0

This connection table shows a chemical structure with molecular formula C_8H_7ClO and the computer representation of the structure. Each atom is numbered and identified with one or two letters representing the element. It is followed by the numbers of the other atoms to which it is connected. Lastly, the type of bond connection is given. Bond type 9 means aromatic, type 5 means a chain single bond, and type 1 is a ring single bond.

Chemical databases

This short article cannot go into detail about the many chemical and chemical related databases. For further information on these the reader will need to refer to the database producer, the online system on which a particular database is available, or to a directory of databases.

In 1980, there were about 500 computer readable databases available in the various branches of science, technology, business, and so on. Some 75 companies made these databases available online in computer systems available for access by telephone and computer terminal connection. By 1986, this number had grown to over 2900 databases available from about 450 different sources.

In many cases the same database is available from more than one source. For example, CA Search, the online computer version of *Chemical Abstracts* which has a total of over five million abstracts in computer readable form, is available from some nine online vendors throughout the world. It is updated every 2–4 weeks, depending on the online vendor. *Merck Index* is available from three different vendors. 13-CNMR databases are available from two vendors, while the LogP database is available from one company only.

The definition of a chemical database is quite broad. It includes the usual bibliographic databases, many patent databases, chemical property databases, and chemical structure/nomenclature databases. An excellent source of information on the latest chemical and other databases is the *Directory of Online Databases*[2] published quarterly and available in many libraries.

The most widely used bibliographic database is the *Chemical Abstracts* database. This adds over 400 000 citations per year and goes back to 1967. It now totals over 7 000 000 citations. The ISI database, *Index Chemicus*, which covers the literature from 1962, includes new chemicals only. it has 4 000 000 citations and is thus smaller in size than the CA database.

In addition to these two large abstracting services, the American Chemical Society (ACS) has computerized 19 of its journals so that entire articles (less tables and diagrams) in computer readable form and can be searched.[3]

There are many non-bibliographic, factual, or numeric databases and the number continues to grow. One important point concerning these databases compared to bibliographic databases is their size. The numeric database usually contains data on only a small number of chemicals. Some, like CESARS (a database of detailed and evaluated toxicological data) have information on about 200 chemicals. The 13-CNMR databases range in size from 15 000 to 50 000. The mass spectral databases range from 40 000 to over 100 000. The larger ones do not have as much information on each chemical as smaller databases.

Thermodynamic databases are available from producers like DECHEMA (FRG), Physical Properties Data System (UK) and Thermodynamics Research Center (Texas A&M University, USA). CCDB is working with IUPAC Commissions to make conductance, solubility, transport properties, enthalpy of vaporization and other databases available on computer tapes and floppy disks as well as through online vendors.

Online computer systems

Databases require computer software to search, retrieve, and/or analyse information. Such software

Dr Fujiwara (Institute of Information Sciences and Electronics, University of Tsukuha, Japan) at the meeting of the Committee on Chemical Databases (CCDB) held at the Royal Society, London, on 5 December 1986.

needs a computer. Online computer systems such as QUESTEL-DARC (France), JICST (Japan), Data-Star (Switzerland), Pergamon Online (UK), BRS, CIS, DIALOG, ORBIT, TDS (all USA) STN (USA and FRG) and so on are each a combination of a database, software, and computer hardware forming a complete system.[2] These online computer system vendors do not generally create and own the databases available on their systems. Thus, the approximately 250 databases on the DIALOG system are maintained and owned by their respective creators, not DIALOG. DIALOG is simply a supplier of others' information. Some, like CAS, primarily have their own databases on their system (STN) although most of their databases are also found on other systems (such as BRS, DIALOG, ORBIT, Pergamon Online, QUESTEL-DARC and others).

The above systems search bibliographic and non-bibliographic databases. In addition there are two major online systems which search for chemical structures. They are CAS ONLINE and the QUESTEL-DARC system. Both contain the entire CAS file of over 7 500 000 chemical structures. The QUESTEL-DARC system also has the ISI database of over 3 500 000 chemical structures associated with the ISI *Index Chemicus* database.

". . . chemical information is now available virtually anytime anywhere."

All systems are available, usually via a local dial-up telephone, in most countries, and usually at nominal prices. The computer systems of some vendors are available 24 hours per day, seven days per week. Availability of the remaining systems is five to six days per week, and usually about 20 hours per day. It is thus fair to say that chemical information is now available virtually anytime anywhere. As telecommunications become easier and less expensive, usage will increase. In many countries and organizations, access is available through a library or similar information group, often at little or no cost to the end user.

Summary

This article provides a brief overview of computer based chemical information in terms of databases and how they are available to the scientific community worldwide. Understanding what is available and where such information and chemical data can be found is becoming more and more important in the high technology world of today. IUPAC is participating in this area through its new Committee on Chemical Databases. Members of Commissions are encouraged to provide input into this Committee in order to help create and make available for dissemination and distribution the valuable data being gathered and evaluated by their Commissions.

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2. *Directory of Online Databases*, is published by Cuadra Associates, 20001 Wilshire Blvd., Suite 305, Santa Monica, CA 90403 USA. It explains acronyms, what databases online vendor companies have available, and how these companies can be contacted.
3. Terant, S. W., Garson, L. R., Myers, B. E. & Cohen, S. M. 1984. Online Searching: full text of American Chemical Society Primary Journals. *J. Chem. Inf. Comput. Sci.*, **24**, 230.

The development of modern chemical nomenclature

Drs V. N. Piottukh-Peletsky and V. A. Scorobogatov

Over recent decades many difficulties have arisen with the development of modern chemical nomenclature. In this paper, Dr Vadim Piottukh-Peletsky of the Institute for Organic Chemistry, Novosibirsk, USSR, and Dr Vladimir Scorobogatov of the Institute for Mathematics of the Siberian Division of the USSR Academy of Sciences discuss these problems and consider the future development of chemical nomenclature using computer based information systems.

Chemistry is a science with a potentially boundless number of topics of investigation. These are the chemical compounds and their physical and chemical properties. Questions of systematization of experimental facts have, therefore, always been a consideration for this science. Any systematization supposes the use of a "name" for each compound. IUPAC traditionally pays great attention to the development of rules for building names of chemical compounds and, indeed, it has been active in this field since its creation in 1919.

Many difficulties have appeared in development of the nomenclature of organic compounds. The formal development of nomenclature started in 1892 with the creation of the so called Geneva nomenclature. The special Commission on Nomenclature of Organic Chemistry was created within IUPAC in 1921. The Commission was responsible for the 1930 Liège rules. IUPAC rules have been published from time to time and collected in the so called *Blue Book* the latest edition of which was published in 1979.[1] This is the most complete collection of modern international rules of nomenclature of organic compounds. Works in this field continues and is regularly published in *Pure and Applied Chemistry*.

Dr Vladimir Scorobogatov.

Two basic requirements

A basic requirement of systematic nomenclature is the provision of an unambiguous compound name according to its structural formula and *vice versa* (requirement "A"). Unfortunately, the development of nomenclature has often deviated from this important principle. These deviations have arisen in order to account for other requirements. Among them we can emphasize the need to reconstruct quickly a molecular structure or, at least, some part of it for example a part which indicates its class for use in an oral report or visual presentation in a text (requirement "B"). As a result of this a great number of trivial names exist in IUPAC nomenclature, for example the names of terpenes, steroids, aromatic and heterocyclic compounds and so on. Some prefixes and suffixes are also associated with particular structural patterns by the chemist.

Dr Vadim Piottukh-Peletsky.

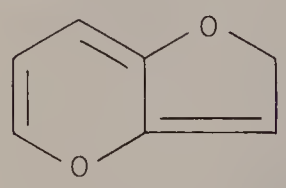
The use of trivial names has deep historical roots. It makes communication among chemists easier and, thus, can hardly be terminated by decree for a more rigorous but less customary nomenclature.

The specific character of nomenclature of various classes of compounds and the large number of exceptions and exclusions have resulted in IUPAC rules exceeding 500 pages. The bulky character of chemical nomenclature rules and the absence of a leading principle has meant that the overwhelming majority of chemists are unable to use them.

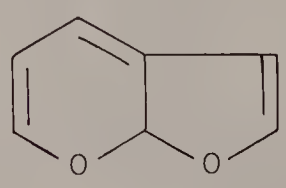
Modern nomenclature is practically useless for construction of computer based information systems on chemistry. Such systems require a rigorous algorithmized approach for the construction of names of chemical compounds and a one-to-one correspondence between structure and name.

This situation in organic nomenclature has developed as a result of deviating from requirement "A" in order to take account of requirement "B". In this connection we need to ask what impact requirement "B" has made on modern nomenclature? We must admit that the answer is not satisfactory. The chemist does not perceive orally or visually the names of most complex organic compounds. This is why chemists, as a rule, use structural formulas in publications, reports and discussions. For example, we believe it is significant that *Angewandte Chemie* began using structural formulas even in their tables of contents in recent years.

The chemist can usually only perceive those parts of a name with particular structural images. For example, only an organic chemist will easily recognize the presence of the structural fragments pyrane and furane in the names 2*H*-furo[3,2-*b*]pyrane and 7a*H*-furo[2,3-*b*]pyrane. Few chemists, perhaps only specialists working with this class of compound or working on that nomenclature will be able to understand that these names correspond to Structures I and II.

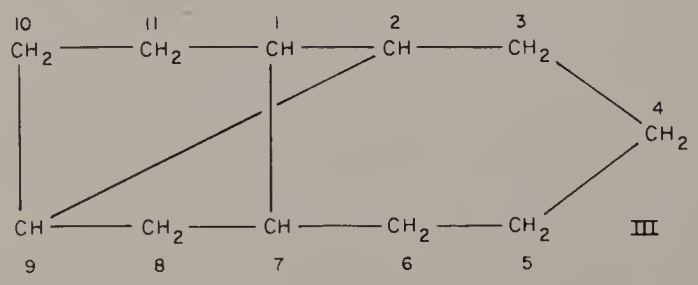


I



II

As another example the organic chemist will only understand that tricyclo[5.4.0.$0^{2,9}$]undecane is the name of a polycyclic hydrocarbon without heteroatoms in its structure. In order to reconstruct this structure many chemists will need to refer to a manual on nomenclature.



III

The future development of organic nomenclature

How then can we develop organic nomenclature in the future? The answers to this question are both complex and crucial. We hope the following thoughts will be a starting point for future discussions.

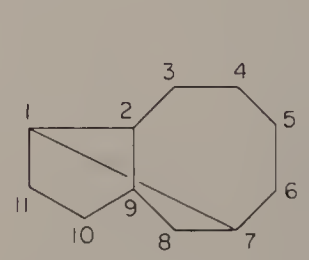
Any system of organic nomenclature is inevitably complicated. It requires the use of reference manuals for interpretation of chemical names. The complete banning of systematic names and the sole use of registry numbers for compounds would be an extreme solution to the problem. In this case, a list of registry numbers and corresponding structural formulas would be a "nomenclature manual". In many publications use of a structural formula and a general term as "polycyclic hydrocarbon (III)", without the full systematic name, would be quite sufficient.

If a "registry number-structure" file is available, the names of compounds could be stored in a computer based information system. The main difficulty with such a system is the determination of a registry number of the structure. Of course, it is possible to create a "molecular formula-registry number" index for structures with a given molecular formula. This would allow chemists to review the "registry number-structure" index of all registry numbers corresponding to a given molecular formula and thus enable them to search for the structure of interest. But one ought to remember that, in many cases, a great number of structures correspond to one molecular formula. For example, in theory 5 622 103 isomeric alcohols[2] have the simple molecular formula $C_{20}H_{41}OH$.

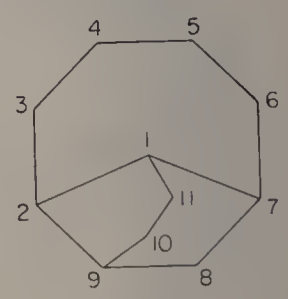
When additional structural characteristics, such as bond molecular formula, descriptors of cyclic systems and so on are included, solutions to the problem become possible. Such additional characteristics make possible the division of groups of chemical structures, with a given molecular formula, into more manageable subgroups. The generation of any additional descriptor code from a structure should, of course, be simple.

Let us consider, as an example, the determination of bond molecular formulas.[3] In contrast with an ordinary molecular formula the set of all possible connected two-vertice fragments of a structure is constructed for the bond molecular formula. These fragments are described by the following characteristics: first vertice type, bond type and second vertice type. For example, if we choose (CH, CH_2, CH_3) as vertice types $(CH_3–CH_2)_2(CH_2–CH_2)_2$ and $(CH_3–CH)_3$ are the bond molecular formulas of butane and isobutane, respectively.

However, there are still more difficulties in the use of registry numbers for chemical compounds. Whilst reviewing "registry number with additional descriptors — structure" index, the chemist must recognize the structure he is interested in from selected registry numbers. But this is not always easy because there are no rules for drawing structural formulas. Not everybody will be able to recognize Structure III in images IV and V quickly enough.



IV



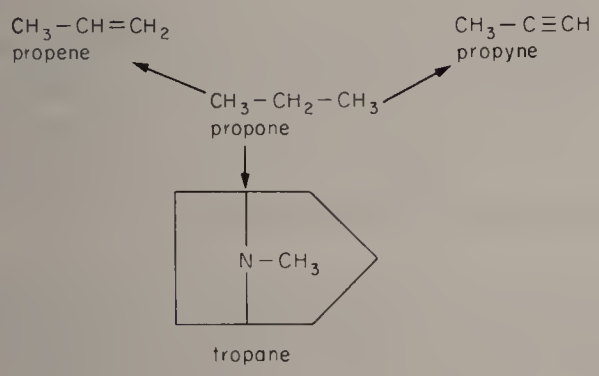
V

If the name of the compound is definitive, checking the identify of its structures, using their different structural representations, is not difficult. But since a

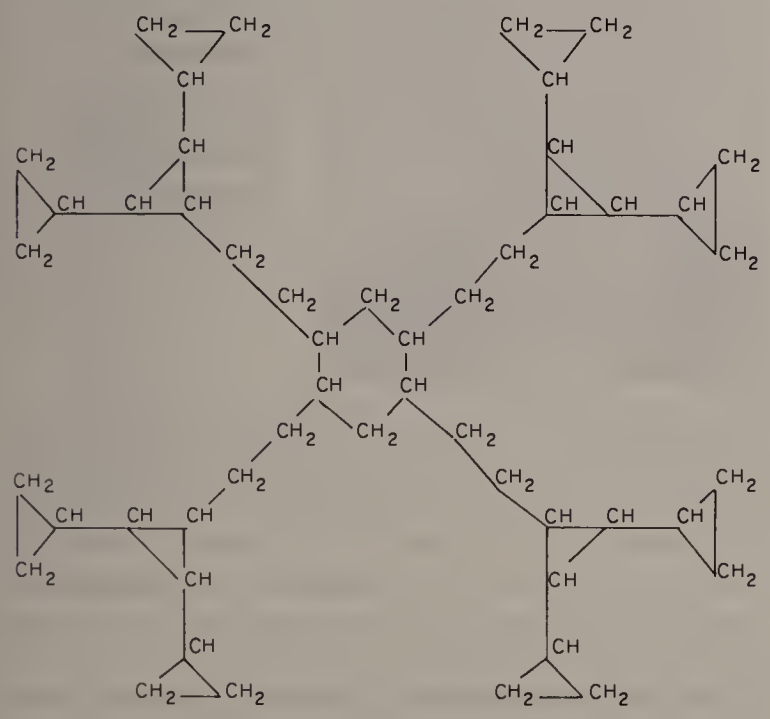
registry number in modern computer based information systems is an arbitrary identifier, the work of recognizing a particular structure using a topological code or picture may not be enough if the discriminating efficiency of the additional descriptors is small.

Use of a code with high discriminating ability means a return to the question of the construction of a name of a compound adequately representing its structure. This is a return to the problem of nomenclature. The use of nomenclature in conjunction with descriptions of chemical structures in data banks may be fruitful for computer based information systems. Duplication of information provides a method of checking errors.

The example below shows how a difference of one letter in a name gives a completely different structure.



Duplication of information facilitates the discovery of errors which are unavoidable in the input of both chemical names and structural formulas to chemistry data bases. But the discovery of errors in a name or structure by comparison is possible only if the computer is able to make a transition from name to structure. That requires a unified and strictly algorithmized system of nomenclature.



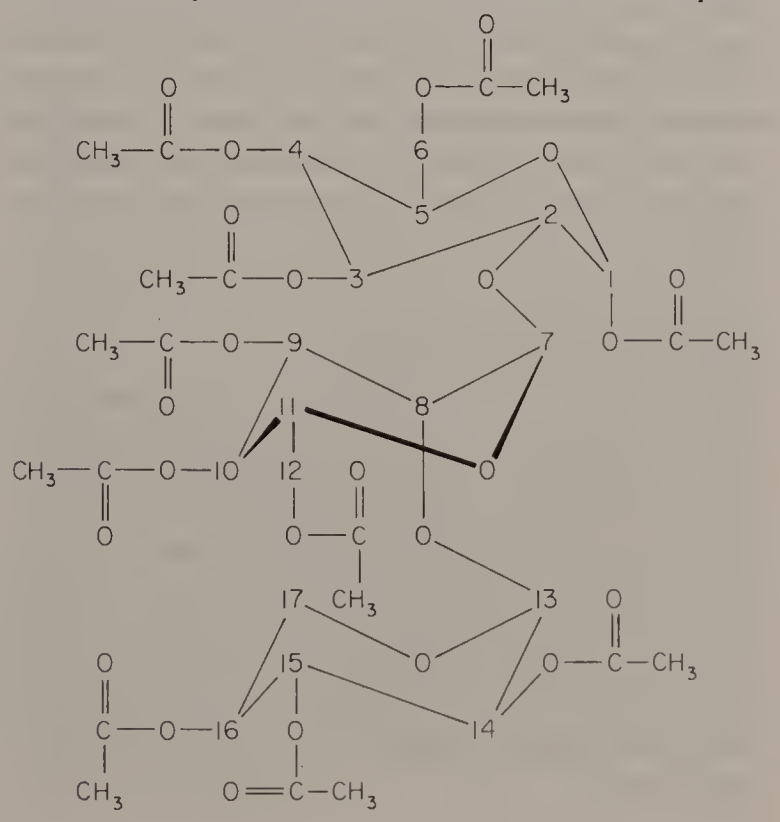
These structures illustrate the computer output of structural formulas of compounds in two modes: (above) exact correspondence with input image of a structure. This requires storage of 2D coordinates of vertices of a chemical graph; (right) algorithmic reconstruction of structural image from connectivity matrix.

Facilities for communicating with a computer using the language of structural formulas developed at the Scientific Information Centre on Molecular Spectroscopy of the Siberian Branch of the USSR Academy of Sciences.

Thus, another extreme solution may be the replacement of present nomenclature by a virtually new system of nomenclature, based on mathematical theory of graphs.[4] This solution requires an absolutely rigorous nomenclature of three-dimensional graphs with labelled vertices.

Let us consider, as an example, drawings of structural formulas. These may be represented as "connectivity matrices" of chemical graphs, which may be transformed into canonized[5] line notation, representing the name of a chemical compound. However, such a name of a compound loses its "image-bearing features". Furthermore, a canonization procedure cannot be performed effectively without a computer.

The creation of a new universal system of chemical nomenclature is, thus, not possible without a computer. Can such a system exist? The creation of a computer



based information system for chemistry is possible. However, nowadays chemists already have simple facilities for communicating with a computer, using the language of structural formulas.

In our opinion the use of present nomenclature will decrease as the use of computer based information systems spread more widely. Nevertheless, termination of the use and improvement of traditional nomenclature is premature. At present it is advisable to retain nomenclature and regard chemical names as comments on structure but without a guarantee of correspondence between name and structure. Use of the next level of information which includes registry numbers and discriminating additional codes will become feasible with the creation of computer based systems and printed indexes.

The question of how chemical nomenclature will develop in future cannot be answered unambiguously. A compromise solution will be necessary. This will require further and detailed discussions. Hopefully, this publication will stimulate such discussions.

We are grateful to Prof. V. A. Koptyug for his advice and helpful discussions on the questions discussed in this article.

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New Subcommittee on Reference Materials

A Subcommittee on Reference Materials in Chemistry was established by the Physical Chemistry Division Committee in 1985 and began work during 1986. The Chairman and other members of the Subcommittee provide, by means of this brief article, a summary of the aims and responsibilities of the Subcommittee. Further, some background information is provided on international activities related to reference materials.

A reference material* is defined as a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning property values to materials. A certified reference material* is defined as a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. The term certified reference material therefore includes all those materials perhaps better known to chemists as analytical standards, clinical standards, calibration standards, etc.

Aim of the Subcommittee

The aim of the Subcommittee is to establish for IUPAC members a means of dialogue with the main international bodies concerned with reference materials. The past 50 years have seen a marked increase in application of reference materials in chemistry, especially those materials certified by national laboratories. Part of this can be attributed to the rapid growth of the field of chemistry over the period. Other changes, such as the trend to more fully automated instrumental methods, have also increased the need for reference materials. Because of this active interest in reference materials, the Subcommittee hopes for a useful information exchange with IUPAC members over the coming years. It especially solicits your questions and comments concerning certification, availability, and use of reference materials.

Dr Endre Juhász, Chairman of the Subcommittee on Reference Materials in Chemistry.

The Subcommittee establishes contact with all IUPAC Divisions to open up two-way information channels. It will make the necessary arrangements so that the Divisions will be provided with materials of the international certifying bodies and will

*ISO Guide 30-1981(E), Case Postale 56, 1211 Geneva 20, Switzerland.

A reference material is defined as a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning property values to materials.

try to ensure that views, comments, and needs of IUPAC should be incorporated in future activities and recommendations of the relevant bodies.

Responsibilities

By assignment of the Physical Chemistry Division, the Subcommittee has the following responsibilities:

1. To coordinate activities on the formulation of recommendations on reference materials within the Physical Chemistry Division.
2. To collect and disseminate information from the international certifying bodies in the field on reference materials to the relevant IUPAC bodies.
3. To encourage activity on reference materials within other IUPAC bodies and to bring these activities to the attention of IUPAC bodies.
4. To monitor activity in the field of reference materials and, when appropriate, recommend to the Physical Chemistry Division Committee, that a Division Subcommittee on Physiochemical Measurements and Standards be reactivated.

International activities

Most of the worldwide coordination of reference material activities has developed over the past 15 years under the auspices of two bodies, the International Organization for Standardization (ISO) and the International Organization for Legal Metrology (OIML).

The ISO Council Committee on Reference Materials (REMCO) developed recommendations regarding the production, certification and use of reference materials. It also developed guides and information sources which foster production, distribution and use of reference materials. The work of REMCO is carried out at an annual meeting, and during the year by means of correspondence and exchange of documents.

The first guides to be adopted deal with terms and definitions relating to reference materials, and with the procedures to be used when reference materials are cited in technical standards specifications and similar documents. Later guides are directed to producers of reference materials. These guides cover general and statistical principles for the certification of reference materials and define the information to be included in a well-prepared certificate. A guide to users of reference materials is now being developed as part of the work of REMCO. All the published guides are available via national standards organizations.

A key outcome realized during the early meetings of REMCO has been the efficiency brought to the exchange of information. The focus of an annual meeting has had a major impact in identifying work underway and stimulating international cooperation in the field. The names and addresses of more than 130 producers and suppliers have been compiled into a directory together with an index of the types of materials available from each one. In another form of information exchange, plans for future production are compiled and circulated to interested producers. This not only helps to reduce duplication of effort, but also fosters cooperative certification when more than one producer has the interest and capability to certify a material.

Several national laboratories have begun to prepare a computerized data base containing information on the certified reference materials produced in their countries. While this activity is still in an early stage of development, the ultimate objective is a computerized data bank which can be interrogated to provide information on the availability worldwide of certified reference materials with particular properties.

Within OIML, Pilot Secretariat 27 (OIML-SP27) on Reference Materials covers essentially the same field of interest as REMCO, with one main difference. The focus of OIML-SP27 is the legal aspects of reference materials and their role in legal metrology. Draft documents currently being prepared by OIML-SP27 cover general principles for the application of reference materials in measurement, and concepts on comparison of reference materials.

The two international bodies have liaison representation and have recently exchanged draft documents to promote coordination and economy of work. One possible outcome of this exchange, and future related work is that REMCO will adopt the legal aspects promulgated by OIML-SP27, while the latter adopts the more general aspects already set down by the former.

While the different disciplines of chemistry have particular needs for reference materials, there is much common ground. It is the purpose of the new Subcommittee to provide a forum where interests and problems can be shared, and a channel by which information can be conveyed. It is hoped that every Division of IUPAC will appoint a contact person for this exchange of information. The Subcommittee hopes to be present at the General Assembly in Boston and to meet all Commissions with an interest in reference materials.

IUPAC members who wish to correspond with the new Subcommittee on Reference Materials in Chemistry should write to one of the following:

Dr Endre Juhász (Chairman),
National Office of Measures (MSZH),
PO Box 19,
H-1531 Budapest XII,
Hungary.

Dr Arthur J. Head,
National Physical Laboratory,
Teddington, Middlesex TW11 0LW,
England.

Mr Stanley D. Rasberry,
Office of Standard Reference Materials,
Chemistry Building Room B311,
National Bureau of Standards,
Gaithersburg, MD 20899,
USA.

Commission & Committee News

Determination of butyric acid

Milk fat and butterfat (sometimes referred to as butyric fat or dairy fat), in contrast with other edible fats, whether derived from animal, marine or vegetable sources, are unusual in that they contain significant quantities of the short-chain fatty acid known as butyric acid.

For this reason butyric acid has long been used by chemists as an identifying criterion for milk fat and although the level of this acid in the latter is subject to natural variation, this variation is sufficiently small to allow the butyric acid content of a fat to be used for assessing the dairy fat content of fatty material.

Milk fat content requirements for certain foodstuffs appears quite often in food legislation — for example a product described as milk chocolate is required to contain not less than 3.5% milk fat under the terms of the Cocoa and Chocolate Directive of the European Economic Commission (EEC); the Common Customs Tariff of the EEC cities milk fat contents in connection with bakery products, confectionary and other food products. Minimum requirements for milk fat content also appear in various standards published by the Codex Alimentarius Commission.

Before the introduction of gas–liquid chromatography the classical methods for determining the authenticity of milk fat (or butterfat) and the level of these in composite fats were based on the water solubility of the short-chain fatty acids (which include butyric acid) and their silver salts, together with the fact that they are readily volatile in steam. Such classical methods, although having the disadvantage of being both empirical and time consuming, are still cited in standard methods since they are required for the determination of the Reichert–Polenksi–Kirschner values. The latter have been traditionally used for the detection of adulteration of butterfat by "non-butyric" fats.

Provided the acids present in a fat do not include short-chain acids containing less than 12 carbon atoms, the determination of its fatty acid composition can be carried out simply by gas–liquid chromatography (GLC) on a routine basis and at isothermal temperatures. However, the volatility of butyric acid (and also that of its methyl ester) requires special conditions to be adopted for its determination and considerable difficulties have been experienced in its routine determination by GLC. Furthermore, when interest is confined to the butyric acid content alone (rather than the whole fatty acid "profile" of the fat under examination) considerable advantages are to be gained from adopting a method which will determine butryic acid in isolation from the other fatty acids inevitably present.

In view of the need for an internationally accepted standard method the IUPAC Commission VI.3 initiated a project to study methods for the determination of butyric acid and, for the reasons indicated above, decided to develop a method based on the isolation of the butyric acid and the direct determination of the "free" acid (rather than in the form of its methyl ester). GLC procedures for the determination of free butyric acid, although differing in certain important aspects, had been simultaneously published in France[1] and the United Kingdom[2] in 1968 and had been used successfully by analysts in the respective countries for many years.

A Commission working group was convened in 1983 which undertook a preliminary study involving the determination of butyric acid content of a sample of "100%" butterfat and a fat containing 10% of butterfat by the method in use in the United Kingdom. Thirteen laboratories took part and in view of the promising results a further study was organized for the following year. Participants in the second study were invited to analyse four samples containing butyric acid levels equivalent to a range from 5 to 100% of butterfat; they were also invited to carry out the determination of butyric acid content using both the method studied in the previous year and the procedure which was in use in France. In order to assess the accuracy of the procedures in addition to their precision, one of the samples provided had been specially prepared to contain a known amount of butyric acid equivalent to approximately 5% butterfat.

Results from the second study, in which 13 laboratories representing 10 countries took part, were very satisfactory. They demonstrated that both procedures were capable of determining butyric acid to an acceptable degree of precision over the whole concentration range of this acid likely to be encountered. In view of the relatively more simple nature, in particular as regards apparatus and procedure, of the first method studied it was decided to standardize it rather than both methods. The text of the standardized procedure, along with a full report on the results of the collaborative study, has now been published in *PAC*.[3]

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W. Dennis Pocklington

Applied Chemistry Division

This report is a brief summary of the meeting of the Applied Chemistry Division Committee held in London, UK, 5–7 December 1987.

Division President's Report

The President made reference to the critical assessment by the Vice-President of the Union, especially work on the Division projects which were not completed and published, which indicated a lack of activity in some Commissions. This criticism, however, was misleading since many of the projects were near completion and two Commissions were only initiated in 1986 after suspension. The Commission on Biotechnology was completely restructured last year. Nevertheless, Dr Kearney insisted that the work of the Commissions should be more regularly evaluated and the international activities (including IUPAC sponsored conferences and workshops, etc.) must be publicized. In discussion it was reiterated that the work of the Division was misunderstood in that the applied nature of the work disguised the fact that much real chemistry was being carried out for the benefit of mankind.

Applied Chemistry Division Committee Meeting, London, December 1987.

Reports from the Commissions

Food (VI.1). The work of the Commission was satisfactory. Six new projects had been initiated and the preparations for the Symposium on Mycotoxins and Phycotoxins in Tokyo in 1988 were in an advanced state.

Biotechnology (VI.2). After the restructure of the Commission, the new programme of work including two projects and three feasibility studies have been initiated, which will include: a glossary of biotechnology terminology; the organization of an open interdivisional symposium (Boston) on biotechnology in chemistry; gathering and comparing various national guidelines for the use of biological materials in chemical processes and a review of terms, symbols and units used in biotechnology. There is a need for fundamental work to be undertaken in the interdisciplinary areas between chemistry and biology.

Oils, Fats and Derivatives (VI.3). There is a high level of interest in the activities of this commission but there is evidence that many national representatives do not participate or co-operate in any way. The projects of the Commission have progressed satisfactorily and the 7th Edition of the standard methods for the analysis of fats and oils has been published. Other projects include the determination of polycyclic aromatic hydrocarbons, tocopherols, toxic metals, solvent residues, lecithins and the detection of adulteration of edible fats and oils. It is significant that the most activity is from Commission members who can make use of laboratory facilities and future membership should be drawn from those persons who are able to make practical contributions. All projects should be official and published finally in *PAC*, which apparently is not the case.

Atmospheric Chemistry (VI.4). The second meeting of the Commission was held in London, UK, 4–5 September 1986. The initial programme of the Commission involves the compilation of an inventory of current global tropospheric sampling programmes and the development of a glossary of terms used in atmospheric chemistry. The choice of these projects is very appropriate relative to the role of IUPAC in defining nomenclature and harmonizing methodology and procedures. In addition, they represent an intelligent start to the work of the Commission, having the potential for more in-depth projects on various specific topics in the future.

The response to the questionnaire on the criteria of siting samples and analytical methodology sent out by the Commission was good, although some problems exist with obtaining data from East European countries. The Commission realizes the need for close liaison with international bodies in order to introduce IUPAC activities into workshops and symposia organized by these bodies.

Progress was also reported to two feasibility studies (pre-projects) in diffusive sampling technique for environmental measures and an inventory of current workplace sampling programmes. These two studies were related and will eventually lead to recommendations being made. There is no doubt that the topics of workplace and indoor atmospheres are important and are now generating much interest by the medical authorities and national regulatory bodies. The recognition of these facts and the need for further work in these areas by the Commission is welcomed.

Pesticide Chemistry (VI.5). The Commission continues to sponsor and organize international congresses on pesticide chemistry and is very active. Progress has been made with three projects which are in the course of preparation for publication. A report "Recommended Approach to the Appraisal of Risks to Consumers from Pesticide Residues in Crops and Food Commodities" will soon be published. It is an important contribution to world knowledge in order to assess potential health problems from pesticide residues in food and is recommended to government agencies and to the pesticide industry.

Water Chemistry (VI.6). The reformed Commission is already active and has chosen, as the main topic of the first workshop, the removal of non-biodegradable substances and heavy metals from waste waters by pretreatment processes. The acceptance of the discharge of both the effluent and the sludge from sewage treatment plants is dependent on the load of heavy metals and hazardous organic micropollutants. The sludge is a resource for fertilization, but it is used with caution because of the pollution hazard. The reduction of the heavy metal content is a prerequisite for that due to their persistence. It is hoped to have a joint meeting with the Commission on Pesticide Chemistry to discuss organic micropollutants in relation to their degradation in soil, their fate in subsoil, the binding of residues and leaching. A list of priority pollutants is being prepared.

The other topics under discussion are the characterization of waste water, sludges and silting standards; threshold limits and the technical processes for decontamination.

Evaluation of Commissions

An in depth review of each Commission was undertaken using a special form developed by President Kearney. Each Commission was evaluated on the number of projects underway, international activities and publications. The review emphasized the fact that certain Commissions need to publish their completed projects. A detailed evaluation will be provided by each Commission Chairman.

Interdivisional matters

The Committee agreed that there should be a better liaison not only between Commissions but also between Divisions so that a global view could be established of the need and value of chemistry and its application to the problems of mankind.

International activities

Commissions within the Division are encouraged to co-operate with international organizations by participating in and sponsoring conferences and workshops.

The Commission on Food Chemistry is involved with symposia on mycotoxins and phycotoxins; natural toxicants and mutagenicity of food; international collaborative studies of carcinogens; and have representatives on various committees of international organizations. The Commission on Fats, Oils and Derivatives participates in meetings concerned with the chemistry and technology of fats and oils and conducts internationally collaborative studies to validate analytical methods. The Commission on Atmospheric Chemistry is developing a database of information on current tropospheric chemistry programmes in various countries and has been represented at many international conferences and organizations.

Dr Kearney discussed a proposed project in which the Division would use the expertise within the Commission of ACD to assist developing nations in specific areas of applied chemistry. Negotiations are well underway for the first such meeting in China in 1988. The Commission on Pesticide Chemistry is planning a 1–2 day meeting with leading Chinese chemists on *Problems and Opportunities for Pesticide Research in China*. The Commission would present papers on metabolism, residue analysis, bioavailability, and registration. Based on the outcome of the project, future meetings would be scheduled in Africa and South America on problems of mutual interest.

P. Kearney

Chemical safety in production

Meeting in Heidelberg, FRG, venue of the CHEMRAWN V Conference, on 21 September 1986, the CHEMRAWN Committee debated the important topic of "Safety in Production and Application of Chemical Products".

The stage was set with a position paper prepared by the IUPAC Study Group convened by W. Schneider, IUPAC past president, which included Bryant Rossiter, Alan Hayes and S. Varadarajan. Following a working session held in India, 2–3 May, the Study Group received a contribution from Dr Karl Büchel, Chairman, COCI and Dr Pilz, Bayer Corporation, who represents the European Federation of Chemical Engineering. After much discussion at Heidelberg it was recommended that any planned IUPAC activity should be limited to the topic: "Chemical Safety in Production". Furthermore, involvement of the European Council of Chemical Manufacturing Federations, Chemical Manufacturers Association in the United States, the Japan Chemical Industries Association and the World Bank was deemed essential for the success of any conference on the subject.

The Committee received a report from Dr Moriya Uchida on the state of CHEMRAWN VI: "Advanced Materials for Innovations in Energy, Transportation & Communications" which will be held in Tokyo, 17–22 May 1987. Attendance of over 1000 is expected for this meeting. A new site was announced for the CHEMRAWN IV Conference:

Heidelberg, venue of CHEMRAWN Committee meeting, September 1986.

"Modern Chemistry and Chemical Technology Applied to Ocean and its Resources". This will be: Keystone Conference Centre, Colorado, USA, 4–9 October 1987. The meeting will now be under the leadership of Prof. Derek Spencer, Associate Director, Woods Hole Oceanographic Institution.

The Committee held a major review concerning: "Goals, Format and Scheduling of Future CHEMRAWN Committee Activities". It was agreed to increase the number of Committee meetings to two per year. The importance of sponsoring conferences of an unconventional type which attract a broad interdisciplinary attendance was reaffirmed. The possibility of involving the CHEMRAWN Committee in the decision-making structure of IUPAC will be discussed with the IUPAC Executive.

R. H. Marchessault

Biotechnology

When the Commission on Biotechnology met in Eberswalde, GDR, 21–24 September 1986 the organization and planning of both short- and long-term projects were considered. The Commission is at a turning point, since past projects have all been completed and a substantial turnover in membership has taken place.

Immediate priority was given to two projects: development of a glossary of terms in current use in biotechnology and elaboration of an educational programme in biotechnology for the chemical community. As the first step in the educational programme, the Commission will organize a symposium on "Biotechnology in Chemistry" to be held in conjunction with a major IUPAC meeting.

Feasibility studies will be undertaken to assess the potential of three other areas as future projects for the Commission:

- The first is a compilation and comparison of existing national guidelines for use of biological organisms (native and genetically engineered) in chemical processes. The Commission will consider whether it can serve the needs of a worldwide community of biotechnologists by distributing a comparison and evaluation of these guidelines.
- The second is a gathering and systemization of various types of reaction carried out in biotechnological processes. It will be determined whether such a cataloguing, together with explanations of the relationships to established chemical reactions and with a listing of potential commercial sources of reagents, would be of use to biotechnological researchers.
- The third is a review and supplementing of the previously elaborated IUPAC recommendations for terms, symbols and units used in bioprocesses.

The Commission clearly recognizes the need of the chemical community to assimilate new biological developments and to maintain the timeliness of the Commission's work. One area targeted as a future project is the evaluation and development of analytical methods of use in biotechnology. The Commission will explore the possibility that this project be carried out jointly with other IUPAC bodies.

Another potential area of future work is a reconsideration both of the current IUPAC-recommended methods of measurement and the consequent value attributed to protein and lipid content in "single-cell biomass" (SCB) or "single-cell protein" (SCP) products of fermentation. In a broader context, the Commission will carry out an ongoing consideration of the research areas of greatest urgency in the interdisciplinary field of biotechnology.

The 8th International Biotechnology Symposium (IBS) will be held in Paris, France, 17–22 July 1988 under the auspices of IUPAC. Arrangements are well underway and it is expected that more than 3000 scientists, including microbiologists, biochemists, geneticists, and chemical engineers, from all over the world will attend.

The Commission welcomed the offer of the Microbial and Biochemical Technology Division of the American Chemical Society to host the next (9th) IBS in 1992 in Washington DC. A final decision on the venue for this meeting will be made during the IUPAC General Assembly in Boston.

The Commission discussed the promise of future interdivisional and interunion activities. A report by the ICSU Ad Hoc Study Group on Biotechnology was summarized, and prospects for future interactions with the IUPAC Working Party on Biophysical Chemistry were considered.

The next meeting of the Commission will be held in Boston, Massachusetts, USA, 22–29 August 1987, during the 34th IUPAC General Assembly. The Commission welcomes any suggestions on its programme of activities. In addition, an opening meeting will be held in Boston on the morning of 23 August. All interested persons are invited to attend.

L. M. Gierasch

Teaching of clinical chemistry

The Commission on Teaching of Clinical Chemistry met in Cartagena, Colombia, 10–13 October 1986 as part of the 8th Latin American Congress of Clinical Chemistry.

The progress of current projects was reviewed. "Guidelines for the Preparation of Laboratory Procedure Manuals for Clinical Chemistry", a joint project with the Commission of Automation and

Clinical Chemical Techniques has reached completion in that a manuscript had been submitted for consideration for publication. It was agreed at the meeting that manuscripts on "The Clinical Chemist's Role in Laboratory Safety" and "Guidelines for Production of Objective-Based Syllabi for Clinical Chemistry" were now ready for submission for consideration for publication.

Of the remaining projects, preparation of "Reference Catalog of Audio Visual and Bibliographical Material for Teaching" continues to be an ongoing project. Little progress has been made with "Drug Effects in Clinical Chemistry: Educational Aspects" and the Commission needs in the very near future to look critically at this project and their collaboration with the International Federation of Clinical Chemists (IFCC) Expert Panel on Drug Effects.

Of other projects in hand, the Commission agreed to look in detail at proposals made for a "Syllabus for Clinical Chemistry Training Laboratory Management", and two manuscripts which were considered to be ready or nearly ready for submission for publication. One of these consists of "Guidelines for Introductory Teaching of Clinical Chemistry" which it was agreed should be submitted to the *International Newsletter on Chemical Education* for publication, and the second, a protocol for conversion to (Molar) SI Units upon which the Commission was awaiting comments from the Commission on Quantities and Units (VII.2). It was agreed that it should be proposed to Commission VII.2 that this be submitted as a joint publication.

At its last meeting the Commission agreed to set-up a number of national working groups to look into and report on, a number of problems. Reports were received from each of these groups. Considerable progress had been made on a correspondence course in clinical biochemistry (Australia) and this group is expecting to submit a draft report shortly. Guidelines for the teaching of clinical chemistry to medical graduates (Australia) was also proceeding satisfactorily and this group expects to report shortly. The co-ordinator for curricula for PhD programmes (Canada) had sought further guidance from the Chairman of the Commission on this programme. This he has now received and it was hoped this would now proceed satisfactorily.

The group concerned with requirements of quality assessment (FRG) hoped to begin their work shortly. The co-ordinator for teaching of immunoassay techniques (UK) had felt that he would not be able to undertake this project. However the Chairman of the Commission proposed to write to him again in an attempt to dissuade him from this view. Failing this, this project would be undertaken by Israel.

The Mexico Clinical Chemistry Project continues to make progress. The basic course programme is now completed, and major progress has been made during the last 12 months in setting up a self-sufficient external assessment programme. An advanced course was arranged immediately after the meeting in Colombia and members of the Commission participated in this programme.

H. G. J. Worth

New directions for Commission on Toxicology

The Commission was reorganized at the Lyon General Assembly in 1985. The meeting at the Institute of Nuclear Sciences, Ghent, Belgium, 30 August–3 September 1986 was the first since the creation of new Subcommittees on Risk Assessment, Analytical Methods and Harmonization Procedures. The Subcommittees on Aluminium and Chromium had been disbanded and their activities transferred. The Ghent meeting provided an opportunity for the new Chairmen of the Subcommittees to present their initial projects and ideas to the Commission.

Dr P. Grandjean (Risk Assessment) said that the task of defining "risk assessment" and perhaps assigning a new name to this sub-committee was of primary importance. He was contacting other IUPAC commissions and other international organizations. Dr Sunderman Jr thought new chemical approaches to risk assessment such as assessment of damage to membranes by toxin-produced free radicals should be considered. Could there be a new clinical chemistry approach to risk assessment?

Dr F. W. Sunderman Jr (Analytical Methods) discussed a proposed scheme for the classification of methods of trace metal analysis proposed by Dr S. Nomoto who has also previously suggested

Dr F. W. Sunderman, Jr: "Need to collect together detailed information."

a general analytical approach for a number of metals. Sunderman said there was a need to collect together detailed information and he thought a wall chart could be developed which would contain this information in columns. The idea was approved in principle. The content might include: information on sampling, reagent chemicals, clinical usefulness and reference values.

Dr Y. Thomassen (Harmonization Procedures) reported that the Subcommittee was continuing some of the previous projects of the Commission and particularly those of the selenium subcommittee. This had already involved proficiency testing programmes and the development of standard reference materials. Similar projects would be taken over gradually from the Cadmium and Nickel Subcommittees.

The meeting discussed a document on "Collection, storage, shipment, and processing of urine, serum, plasma and blood specimens for nickel analysis" by Drs Nieboer and Jusys. It was agreed that this document should be restructured.

D. B. Tonks

Provisional Recommendations

IUPAC seeks your comments

All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres appeared in *CI*, Vol. 9, No. 1, p. 27 (1987).

Nomenclature for organic chemical transformations

These rules provide a general system of nomenclature for transformations whereby one organic compound is converted into another. A *transformation* is distinct from a *reaction* in that it describes only those changes that are involved in converting the structure of a substrate into that of a product, regardless of the reagent or the precise nature of the substrate, or (with some exceptions) the mechanism. Thus all processes in which *X*–H is converted into *X*–NO_2 are examples of the single transformation called 'nitration', whatever the nature of *X*, and irrespective of whether the reaction entails the replacement of H^+ by NO_2^+, of $H^\cdot$ by $NO_2^\cdot$, or of H^- by NO_2^-.

The basis of the names of all transformations is that they provide a description of the conversion of substrate into product by giving a string or strings of the names of groups or entities that become attached to and/or detached from the substrate, followed by a suffix that describes the nature of the transformation. Straightforward examples are self-explanatory; for example: 'hydro,chloro-addition'; 'dibromo-elimination': 'hydroxy-de-iodo-substitution'. For many transformations, particularly substitutions, simplified names are recommended for use in speech or writing (by contrast to the more detailed indexing names). Thus 'hydroxy-de-iodination' may be used instead of 'hydroxy-de-iodo-substitution', or 'nitration' instead of 'nitro-de-hydro-substitution'. A list of non-systematic names is given for transformations that are too complex to be named by the present systematic rules.

Comments on the report are welcome and should be sent before 30 November 1987 to the Secretary of the Commission on Physical Organic Chemistry, Dr R. A. Y. Jones, School of Chemical Sciences, University of East Anglia, University Plain, Norwich NR4 7TJ, UK.

Nomenclature of inorganic chemistry (the Red Book): Revision of 2nd Edition (1970)

Chapter I-7: Neutral molecular compounds

This chapter describes, with illustrative examples, the essential characteristics of the nomenclature of relatively simple neutral compounds, giving rules for name-construction: (a) for molecules regarded

as substitution derivatives of parent hydrides; and (b) for coordination entities.

In the case of those of class (a) the principles of substitutive nomenclature are explained and the nomenclature of a chosen set of parent hydrides described. These principles are extended to cover the nomenclature of oligonuclear hydrides, to various categories of chains of atoms, including branched, and to simple cyclic systems. This section also treats the procedure to be followed for cases exhibiting varied bonding numbers for the central atoms, including unsaturation, and supplies rules for numbering.

In the case of class (b) the principles of co-ordination nomenclature are described and extended from mononuclear co-ordination entities to dinuclear compounds, whether or not symmetrical, and then to relatively simple oligonuclear entities.

Chapter I-10: Coordination compounds

The nomenclature of coordination compounds constitutes a major system of addition nomenclature that is based on structural relationships associated with the compounds of the metallic elements. Basic concepts and definitions are presented and the discussion proceeds to formulae and names for the simplest co-ordination compounds. The nomenclature of mononuclear co-ordination compounds with monodentate ligands is extensively developed with listings of names and abbreviations for many common ligands. Stereochemical descriptors are then presented that designate the geometric arrangements of ligands. Formulae and names for chelate mononuclear complexes follow with special attention being given to the kappa convention for identifying the ligating atoms of ambidentate and polyfunctional ligands, and to stereochemical descriptors for chelated compounds. Chirality symbols are introduced for various polyhedra structures and the skew line helical reference is presented along with an alternative technique based on the Cahn, Ingold, Prelog (CIP) priority sequence of ligands. A limited treatment is provided for more intricate species including polynuclear complexes and clusters, with emphasis given to central atom numbering and bonding notation. A summary of the nomenclature for single-strand coordination polymers is given and the final section is a brief introduction to the nomenclature of organometallic complexes.

Comments on both chapters are welcome and should be sent before 31 December 1987 to the Commission Secretary, Dr E. Samuel, Laboratoire de Chimie Organique Industrielle, École Nationale Supérieure de Chimie, 11 rue Pierre et Marie Curie, F-75231 Paris Cédex 05, France.

CHEMLAB ASIA

Malaysia's Putra World Trade Centre in Kuala Lumpur is to host a major scientific and industrial exhibition and conference — CHEMLAB ASIA — from 14–17 October 1987. CHEMLAB ASIA will focus not only on technology and equipment appropriate to the development of South East Asia's chemicals industry, but also on the application of laboratory science in industry, agriculture, medicine, education and the operation of public services.

The six Association of South East Asian Nations (ASEAN) member states — Malaysia, Indonesia, Thailand, Philippines, Brunei and Singapore have abundant resources of oil and natural gas which provide the natural basis for their emerging chemical and petrochemical industries. These industries, in turn, find applications for their products in heavy industries such as iron and steel, tin palm-oil and rubber related industries (Malaysia is the world's biggest producer of all three), textiles, and food and beverages. They thus need a wide range of related laboratory and instrumentation equipment, not only for quality control but also for indigenous research and development projects.

CHEMLAB ASIA will be held in parallel with two major conferences — the Asian Science and Technology Conference, 14–16 October 1987, organized by the Malaysian Scientific Association, and the Malaysian Chemical Conference, 16–17 October 1987, organized by the Malaysian Institute of Chemistry.

For further information contact either *John Fletcher, International Conferences and Exhibitions Ltd, Speen House, Porter Street, Baker Street, London W1M 1HY, UK. Tel: 01 487 2622. Telex: 21591* or *Malaysia/Singapore Office, Resource Ventures Sdn. Bhd., 6B Jalan 52/4, 46200 Petaling Jaya, Selangor, Malaysia. Tel: 03 756 3557/03 756 3619.*

Terminology and Knowledge Engineering

An International Congress on Terminology and Knowledge Engineering, organized by INFOTERM (International Information Centre for Terminology) and under the patronage of UNESCO will be held at the University of Trier, FRG, 29 September–1 October 1987.

Further information from Udo Clesius, Universität Trier, Postfact 3825, D-5500 Trier, FRG. Tel: (0651) 2 01 27 32.

IUPAC General Assembly

BOSTON

34th IUPAC Council Meeting
Boston, USA, 28–29 August 1987

AGENDA

1. Introductory Remarks and Finalization of Agenda
2. Approval of Minutes of 33rd Council Meeting and Matters Arising
3. Announcement of Nominations for Officers and Bureau Members
4. Announcement of Time of Elections
5. Statutory Report of President on State of Union
6. Report of Finance Committee
7. Biennial Report of Treasurer and Accounts for 1985–86/Appointment of Auditors
8. Reports of Division Presidents
9. Report of Publications Committee
10. Report of CHEMRAWN Committee
11. Report of Committee on Teaching of Chemistry
12. Report of Committee on Chemical Databases
13. Report on Affiliate Membership Scheme
14. Continuation/Dissolution of Existing IUPAC Bodies and Proposals for New Bodies
15. Tentative Budgets for 1988–89 and National Subscriptions for 1988–89
16. Proposals Formally Received from National Adhering Organizations
17. Important Matters Discussed by Bureau at 34th General Assembly not Covered by Items on Council Agenda
18. Elections
19. Ratification of Dates and Places of 35th General Assembly and 32nd Congress
20. Provisional Places of 36th General Assembly and 32nd Congress (1991)
21. Applications for Membership of IUPAC
22. Applications for Associated Organization Status
23. Language for Official Records during 1987–91 (Statute 5.405)
24. Adoption of Recommendations on Nomenclature and Symbols
25. Ratification of Decisions taken by Bureau and Executive Committee since 33rd General Assembly
26. Any Other Business (discussion only)

Boston Nobel Laureates in chemistry

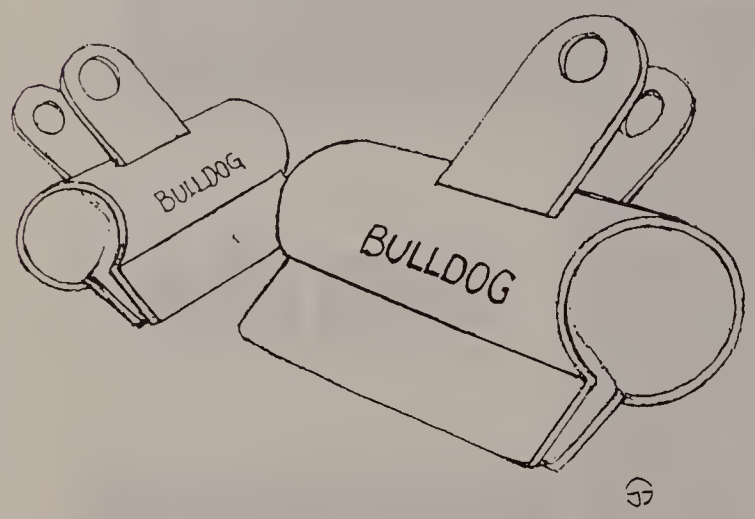
BOSTON

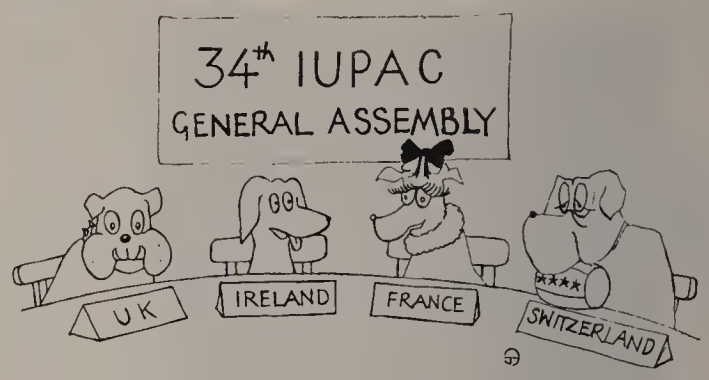
For its size and population, greater Boston has produced more Nobel laureates in the natural sciences than any other comparable area. The great majority were associated with Harvard University, the Massachusetts Institute of Technology (MIT) and Tufts. The photographs above show five Nobel Laureates in chemistry from Harvard University. The year in which they won the prize and the work for which they won it is shown in brackets.

Centre: T. W. Richards (1914, for research on fixing the atomic weights of elements); top left: Robert Burns Woodward (1965, for the laboratory synthesis of complex molecules); bottom right: William N. Lipscomb (1976, for research on the structure of boranes, which has increased the understanding of chemical bonding); top right: Walter Gilbert (1980, for developing methods to work out the structure of DNA); bottom left: Dudley Herschbach (1986, for applying molecular beam techniques to the study of chemical reactions).

Would Irish Setters do?

As many of you will know, conferences, symposia and general assemblies take many years to plan and prepare. Back in 1982, when preparations for the 34th IUPAC General Assembly were well under way, IUPAC Deputy Executive Secretary Miss Ann Troughton sent to the US National Committee a list of stationery and office equipment required for use by the Secretariat staff and Officers at the Assembly. The list included white paper, pads, pencils, ball-point pens, paper clips, staples, staplers, scissors, envelopes AND 30 large and 30 small *bulldogs*.





In the UK, bulldogs are familiar not only to pet lovers but also to bureaucrats as useful items for clipping papers together (see cartoons). However, following a letter back from the USA, it became apparent that the use of bulldogs in offices is not well known in the USA. The letter was from Mrs Peggy J. Posey, Staff Assistant at the National Research Council (USA). She wrote:

> "We see no problem meeting your requirements, save one . . . your request for 30 large and 30 small bulldogs! After some discussion we have decided that, since we have five years to work on the problem, we can start with one male and one female dog and by 1987 we should have 60 various-sized animals to meet your needs. However, *Boston* may not allow us to bring in so many *English* bulldogs. Would Irish Setters do?"

Elections

The climax of the General Assembly is reached towards its end when the Council meet. According to Statute 5.401 Council must elect Officers of the Union and Elected Members of the Bureau. Nominations for the various positions that fall vacant in 1987 were required before 28th June. The following are details of candidates who had been nominated by the time this issue went to press (7th April).

President

Prof. V. A. Koptyug (USSR)

Prof. V. A. Koptyug, Vice-President and President-Elect, becomes President at the close of the Council meeting in Boston. A brief pen-portrait of Koptyug was published in the previous issue of this magazine (see *CI*, Vol. 9, No. 3, p. 114, 1987). He will hold office as President until the close of the Council meeting held at the next IUPAC General Assembly which will be held in Lund, Sweden, 9–18 August 1989.

BOSTON

Vice-President

There is a vacancy for this office. The Vice-President to be elected will be President-Elect and will become President at the close of the Council meeting held at the 35th General Assembly in 1989.

Prof. Y. P. Jeannin (France)

Prof. Yves P. Jeannin was born in 1931. He received his degrees at the University of Paris. His thesis was prepared with Prof. J. Bénard, a former IUPAC President. The thesis was concerned with non-stoichiometric titanium sulfides. After post-doctoral research fellowships at Argonne National Laboratory (USA) and Iowa State University (USA) he was appointed Lecturer at the University of Paul Sabatier in Toulouse, France. During his 10-year stay there he became interested in coordination and organometallic compounds and the determination of their structures using X-ray diffraction.

In 1974, he moved to Paris as Professor of Inorganic Chemistry. Here he developed the chemistry of polymetallic species, particularly polymetalates and clusters. The latter were used as models for organic inhibitors used to protect metal surfaces from corrosion.

Jeannin is the author of about 160 publications. He was elected a Corresponding Member of the French Academy of Sciences in 1981 and was Chairman of the Committee which renewed the teaching of chemistry in French High Schools. He is currently Secretary of the French National Committee for Chemistry. This is the French National Adhering Organization (NAO) to IUPAC. He is Chairman of the French Committee for International Scientific Unions.

Within IUPAC, he became an Associate Member of the Commission on the Nomenclature of Inorganic Chemistry in 1969 and a Titular Member in 1971. He was elected Vice-Chairman in 1975 and became Chairman in 1981. He represented Commission II.2 on the joint IUB–IUPAC Commission from 1977 to 1980 and was a member of IDCNS. In 1979, he was elected to the Bureau and became a Member of the Executive Committee in 1983.

Dr B. W. Rossiter (USA)

Dr Bryant W. Rossiter, a native of Salt Lake City, Utah, received both his BA and PhD degrees in chemistry from the University of Utah in 1954 and 1957, respectively. From 1970 to 1984 he served as Director of the Chemistry Division of the Eastman Kodak Research Laboratories, Rochester, New York. In this capacity he had managerial responsibility for much of Kodak's pioneering and long-range exploratory chemical research. In 1984, he became Director of Science and Technology Development at the Kodak Research Laboratories. Rossiter became Vice President of ICN Pharmaceuticals and President of its subsidiary, The Viratek Corporation, in July 1986. The latter companies are leaders in the fields of viral, cancer and nucleic acid research.

Rossiter served as a member of the United States' National Committee IUPAC from 1973 to 1982 and was Committee Chairman from 1979 to 1982. He was a member of the IUPAC Finance Committee from 1975 to 1977. Rossiter was involved in the creation of the CHEMRAWN concept and served as Chairman of the CHEMRAWN Committee from its inception in 1976 to 1986.

Rossiter served as a member of the United States Advisory Committee for the International Council of Scientific Unions from 1980 to 1982. This body provides administrative support and policy guidance to the US scientists participating in non-governmental, international scientific activities.

Since 1981, he has served as a member of the International Activities Committee of the American Chemical Society and was Committee Chairman from 1984 to 1986. Rossiter is also a member of the Research Advisory Committee of the United States Agency for International Development.

Rossiter is a member and Past-President of the Board of Trustees of the Eastman Dental Center, one of the world's foremost dental research organizations. He co-edits *Physical Methods of Chemistry*, a major reference work found in most technical libraries and scientific institutions around the world. He has been a member of the Editorial Boards of *Science* magazine and *Chemical & Engineering News*.

Past-President

Prof. C. N. R. Rao (India)

The retiring President, Prof. C. N. R. Rao, remains a member of the Bureau for a period of two years. The Past-President is not an Officer of the Union.

Secretary General

There is a vacancy for this office. Prof. T. S. West, the present Secretary General, is eligible for re-election, having completed four years (1983–87) of service:

Prof. T. S. West (UK)

Prof. Tom West, born in November 1927 in Peterhead, Scotland, UK, received his BSc at Aberdeen University and his PhD and DSc (1962) at the University of Birmingham. In 1963 he moved to Imperial College, London, as Reader in Analytical Chemistry, becoming Professor in 1965. Ten years later he was appointed Director of the Macaulay Institute for Soil Research, Aberdeen, the position he held until recently.

West has been active in the Society for Analytical Chemistry (President 1969–71). He serves on the Council of the Royal Society of Chemistry and is a member of its International Affairs Committee. West has also been active on committees of the Royal Society which is the British National Adhering Organization of IUPAC. He currently serves on the British National Committee for Chemistry and was Chairman of its Analytical Subcommittee for 18 years. He has also been a member of the joint Royal Society/Royal Society of Chemistry Nomenclature Subcommittee.

His research interests cover a wide area in the field of analytical chemistry, including atomic and molecular absorption and fluorescence spectroscopy, polarography, trace analysis in general, chelate chemistry and biosignificant trace elements in soils and plants. He has lectured on analytical chemistry throughout the world and has received a number of national and international awards and distinctions.

West's IUPAC experience started in 1965 when he became Secretary of Commission V.3. He was elected to the Division V Committee in 1971, became Vice-President in 1973 and served as Division President 1977–81. He was appointed Assistant Secretary General in 1981 and became Secretary General in 1983. He has been very much concerned with the development of the Affiliate Membership Scheme.

Treasurer

There is a vacancy for this office. Prof. A. Björkman, the present Treasurer, is eligible for re-election, having completed four years (January 1984–December 1987) of service:

Prof. A. Björkman (Denmark)

Prof. Anders Björkman was born in Stockholm, Sweden, in May 1920. He was awarded his PhD at Stockholm in 1948 and DSc by the University of Gothenburg in 1957. He worked on industrial fermentation at KABI (Sweden) and then, in 1945, as Assistant Professor at the Royal Institute of Technology. In 1948 he joined Billeruds AB to do research and development in the pulp and paper industry and in 1961 was appointed Professor of Chemical Engineering and Technology at DTH, Lyngby, becoming a Danish citizen in 1962.

Björkman is a Fellow of the Danish Academy of Technical Sciences, the Danish Society of Natural Sciences, the Institute of Energy (London), and Foreign Fellow of the Swedish Academy of Engineering Sciences. He is also a Fellow of the International Academy of Wood Science. The Academy elected him to various positions including Secretary/Treasurer, 1980–84.

From 1968 to 1974 Björkman was Danish National Representative on the IUPAC Macromolecular Division Committee and was elected to the Finance Committee in 1971, serving as Chairman from 1977 to 81. He assumed office as Treasurer in 1984.

Bureau

The Bureau consists of the Officers, the immediate Past-President, the Presidents of the Divisions/Sections, together with not less than 10 other members elected by Council. These are known as "Elected Members". At the conclusion of the 33rd General Assembly in Lyon, there were 11 Elected Members of the Bureau (although Prof. V. Gold died 29 September 1985). At the 34th General Assembly the Bureau will make recommendations to Council as to the number of Elected Members (10 or more), who should be on the Bureau for the succeeding two years.

Elected Members are elected for a period of four years and are eligible for election for a second period of four years. No Adhering Organization may have more than one Elected Member of the Bureau. Statute 7.2 also states that "the principle of fair geographical representation of Members shall be taken into account".

- *Elected Members of Bureau, retiring in August 1987, who are not eligible for re-election*, but may be nominated for another office:

  Prof. Y. Jeannin (France); Prof. A. A. Vlcek (Czechoslovakia); Prof. D. B. Tonks (Canada); Prof. H. Gg. Wagner (FRG).

- *Elected Members of Bureau, retiring in August 1987, who are eligible for re-election for a further 4-year period:*

  Prof. A. J. Arvía (Argentina).

- *Elected Members of Bureau, who were elected at the 33rd General Assembly until 1989:*

  Prof. A. D. Campbell (New Zealand);
  Dr Mary L. Good (USA);
  Prof. W.-Y. Huang (Chinese Chemical Society);
  Prof. S. Itô (Japan);
  Prof. I. Wadsö (Sweden).

At least five Elected Members of the Bureau must be elected at the 34th General Assembly in Boston, that is, the minimum number of 10 Elected Members less the five Elected Members who continue in office until 1989. By 7 April the following nominations had been received:

Prof. M. T. Beck (Hungary)

Prof. M. T. Beck was born in November 1929 in Szõreg, Hungary. He graduated from the University of Szeged with a BSc degree in 1952 and obtained a PhD degree from the same university in 1957. In 1963 he was awarded a DSc by the Hungarian Academy of Sciences.

From 1950 to 1952 Beck was demonstrator and from 1952 to 1968 research chemist at the University of Szeged. In 1968 he became Professor of Physical Chemistry at Kossuth Lajos University, Debrecen. From 1981 to 1982 he was Vice-Rector at the university and is currently Acting Rector.

Beck became a Corresponding Member of the Hungarian Academy of Sciences in 1973 and a Full Member in 1979. He was Chairman of the Academy from 1976 to 1985. In 1985 he became a Member of its Praesidium. His honours and awards include State Prize (1985); Honorary Member of the Finnish Academy of Sciences (1984); Honorary Member of the Akademie der Wissenschaften der DDR; and Fellow of the Royal Society of Chemistry (1981).

Beck has been active in IUPAC for over 20 years. He was a Titular Member of the Commission on Equilibrium Data from 1965 to 1979. From 1970 to 1979 he was leader of the project on "Critical surveys of stability constants". Since 1970 he has been a National Representative for Hungary and since 1983 a Member of the Inorganic Division Committee.

His fields of research include: thermodynamic and kinetic study of reactions of metal complexes; mechanisms of redox reactions; catalytic activity of metal complexes; prebiotic co-ordination chemistry, periodic reactions and analytical chemistry.

Beck is the author of over 250 books and papers in English, Russian and Hungarian. He has edited the proceedings of Coordination Chemistry Symposia and is a member of the editorial boards of several journals. He has presented lectures at numerous international conferences.

Prof. R. D. Brown (Australia)

Prof. R. D. Brown is Chairman of the Chemistry Department at Monash University. After graduating with a BSc and MSc from Melbourne University and a PhD from London University he held lecturing positions at London University (University College) and Melbourne University before being appointed Professor of Chemistry at Monash in 1959. He was awarded the Masson (1948), Rennie (1951) and Smith (1959) Medals of the Royal Chemical Institute, the David Syme Prize for research by the University of Melbourne (1959), the Edgeworth–David Medal of the Royal Society of New South Wales (1961) and the Royal Society Medal of Victoria (1977). In 1963–64 he was President of the Victorian Branch of the RACI. He was President of the Victorian Badminton Association in 1960–61.

In 1965 he was elected a Fellow of the Australian Academy of Science and has been a member of the Council of the Academy and Vice-President of Physical Sciences. He was elected Secretary of Physical Sciences (Academy of Science) 1976–79. He has been Chairman of the National Committee for Chemistry and a member of the Sub-Committee on Chemical Education, Chairman of the Committee on Science Policy and was a member of UNESCO's Australian National Advisory Committee's specialist Committee for Natural Sciences. He is currently a member of the Organizing Committee for Commission 51 (Search for Extraterrestrial Life) of the International Astronomical Union and a Discipline Specialist for the International Halley Watch.

Prof. Brown has led the Australian delegation to IUPAC General Assemblies since 1981. He is currently an Associate Member of the Commission on Molecular Structure and Spectroscopy (I.5).

His current research interests cover theoretical chemistry, spectroscopy, galactochemistry and life in space. He is the author of some 240 scientific publications.

Prof. J. Jortner (Israel)

Prof. Joshua Jortner was born in March 1933 in Tarnow, Poland and emigrated to Israel in 1940. He received his PhD in physical chemistry from the Hebrew University, Jerusalem in 1960. After service in the Faculty at the Hebrew University as a Lecturer from 1960 to 1962, he spent two years (1962–64) as a Research Associate and an Associate Professor at the University of Chicago, USA. Jortner then joined the staff of Tel Aviv University as an Associate Professor and Chairman of the Department of Physical Chemistry. In 1966 he became Full Professor of Chemistry at Tel Aviv University and is now incumbent of the Heinemann Chair of Physical Chemistry. At Tel Aviv University he served as Head of the Institute of Chemistry and Chairman of the Chemistry Department from 1966 to 1972 building the research and teaching infrastructure of the department. Jortner has undertaken duties of Deputy Rector (1966–69) and Vice-President (1970–72) of Tel Aviv University.

Jortner's international activities involve membership on editorial boards of several professional journals. He was a Visiting Professor and Guest Lecturer at important universities in Europe and USA. He has attended numerous scientific conferences, presenting plenary and invited lectures and acting as a leader of sessions. He has also been involved in the organization of international scientific conferences and workshops. Since 1980, he has been the co-organizer of the Jerusalem Symposia on Quantum Chemistry and Biochemistry.

Jortner has authored and co-authored over 480 books, articles and reviews in the areas of theoretical chemistry and chemical physics.

In 1982 he was elected a member of the International Academy of Quantum Molecular Sciences. Jortner was elected in 1973 as a member of the Israel National Academy of Sciences and Humanities. From 1980 to 1986 he served as Vice-President and now holds the office of President at this Academy.

Jortner's past and present research activities have attempted to contribute to the understanding of dynamic processes and relaxation phenomena in molecules and in condensed phases. Research on condensed phases addressed the interrelationship between electronic structure, transport and dynamics of excess electrons and excitons in molecular crystals, as well as in disordered materials, such as polar and non-polar dense fluids and expanded metals.

Dr P. Kratochvíl (Czechoslovakia)

Dr Pavel Kratochvíl was born in Prague in February 1930. He is currently Chief Research Fellow (Research Professor), Head of the Department of Physical Chemistry of Polymers and Head of the Laboratory of Molecular Parameters at the Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Prague.

In 1953 he became a Master of Engineering at the University of Chemical Technology in Prague. Until 1957 he was Lecturer on physico-chemical principles of technological processes in the Department of Organic Technology at the university. Kratochvíl obtained his PhD in 1960 at the Institute of Macromolecular Chemistry with a thesis on the study of the mechanism of heat denaturation and aggregation of albumin. Since then he has remained at the Institute. His main field of activity is physical chemistry of polymers, particularly the investigation of solution properties of polymers and copolymers and light scattering from polymer solutions.

In 1968 he received a DSc at the Institute for a thesis on complicated systems of macromolecules in dilute solutions. Since 1969 he has also been adjunct professor of physical chemistry of polymers at the University of Chemical Technology.

Kratochvíl is the author of about 140 papers on physical chemistry of polymers and particularly polymer solutions. He has also presented 10 invited lectures at major international meetings and over 150 communications at other international scientific meetings.

In 1970, the President of Czechoslovakia conferred on him the National Prize for Science and in 1977 he received the Prize of the Czechoslovak Academy of Sciences.

Kratochvíl became an Observer of IUPAC's Commission on Macromolecular Nomenclature in 1977, a Titular Member in 1979 and Chairman in 1985. Since 1985 he has also been a Member of the Interdivisional Committee on Nomenclature and Symbols (IDCNS). He has been closely involved in various IUPAC sponsored meetings in Prague including the International Symposium on Macromolecules in 1965 and many of the Prague meetings on macromolecules (30 microsymposia and 10 discussion conferences) over the last 20 years.

Mr T. H. G. Michael (Canada)

Mr T. H. Glynn Michael was born in May 1918. He obtained an honours degree in chemistry at the University of Toronto in 1940. In 1946, he became Chief Chemist at Woburn Chemicals Limited in Toronto and in 1953 Director of Research at Howards and Sons (Canada) Ltd. From 1958 until 1985 he was Executive Director of The Chemical Institute of Canada in Ottawa. He is now Principal in T. H. G. Michael Associates, consultants in chemical and scientific society management, publications, and conventions.

Michael is a Fellow of the Chemical Institute of Canada and Royal Society of Chemistry (UK). He is also a member of the American Chemical Society. His 25 publications fall into two main groups: (i) technical and scientific aspects of protective coatings and related chemicals; (ii) the management of scientific societies, and particularly the role of chemical scientists in their organizations and in the community.

He has received several honours including the Canada Centennial Medal (1967) and the Canada, Queen's Silver Jubilee Medal (1977). From 1960 to

1971 he was Treasurer of the Youth Science Foundation, the Canadian organization devoted to fostering interest and excellence in relation to science among secondary school students. He was also Founding Executive Director of the Association of the Scientific, Engineering and Technology Community of Canada (1969–72).

T. H. Glynn Michael has been involved in promoting the use of science and technology, particularly chemical science in Third World countries. For example, he has participated in the organization of the Caribbean Chemical Conference and helped found the Inter-American Confederation of Chemical Engineering. He was representative to the Canadian Commission for UNESCO and helped organize the 1978 UNESCO Conference in Canada on University/Industry Interactions in Chemistry for Developing Countries.

He was Secretary of the Canadian National Committee for IUPAC (1974–85) and Titular Member of the IUPAC Publications Committee (1978–86). He has been a Member of and Secretary to the Canadian Delegations to IUPAC Councils and General Assemblies since 1975. Michael was also involved with the organization of CHEMRAWN I, Toronto, Canada, 1979 and the 6th International Congress of Pesticide Chemistry.

Prof. G. Modena (Italy)

Prof. Giorgio Modena was born in Ancona, Italy, in 1924 and studied at the University of Bologna obtaining the degree of "Dottore in Chimica Industriale" in 1947. He carried on with research work at the University and obtained his first teaching appointment there. In 1963, he was appointed to the Chair of Organic Chemistry at the University of Bari and then, in 1967, moved to the University of Padua where he is Professor of Organic Chemistry.

Modena's scientific research activities have been mainly concerned with the study of organic reaction mechanisms. In 1956, during a postdoctoral research fellowship at University College, London, he started work with Dr A. D. Allen, under the supervision of Prof. E. D. Hughes, on nucleophilic substitution of silicon. At that time Prof. Sir Christopher Ingold was Head of the Chemistry Department.

His work on the chemistry of sulphenyl-halides led to the synthesis of the first thiirenium ions. He has also worked on vinyl cation chemistry and, in particular, nucleophilic substitution on vinylic carbon. Other long-term interests have been oxidation and peroxide chemistry, the chemistry of sulphur-organic compounds and the protonation behaviour of weak bases in strong acids.

Modena has been active as an organizer of and participant at several international congresses. He has also been particularly active in the Italian Chemical Society (SCI) of which he has been a member since the forties. He was its Vice-President (1977–79). He has also served (1981–85) as Chairman of the Chemical Science Committee of the Italian National Research Council (CNR, Rome). In addition, he is a member of the National Academy of Science, Rome and Correspondent Member of the Istituto Veneto di Science, Lettere ed Arti.

In 1975 Modena was elected Titular Member of the Organic Chemistry Division Committee. He served as Secretary of the Committee (1979–81), Vice-President (1981–83) and President (1983–85). He is currently a co-opted member of the Committee and Chairman of the Italian National Committee for IUPAC.

Prof. N. Sheppard (UK)

Prof. Norman Sheppard was born in May 1921. He studied at Cambridge University where he obtained a BA (1943), MA (1947) and PhD (1947). He is now at the School of Chemical Sciences, University of East Anglia, Norwich. He was formerly Assistant Director of Research in Spectroscopy and Fellow of Trinity College, Cambridge University.

Sheppard has been a Fellow of the Royal Society since 1967 and is a Fellow of the Royal Society of Chemistry and the Optical Society of America.

He was Titular Member of the IUPAC Commission on Molecular Structure and Spectroscopy

from 1967 to 1975 and its Chairman from 1971 to 1975. From 1975 to 1983 he was a Member of the Physical Chemistry Division Committee and President of the Division from 1979–83. Since 1981 he has been a UK Delegate to IUPAC Councils. As Chairman of the British National Committee for Chemistry he will be Leader of the UK Delegation at this year's Council meeting.

Sheppard's research interests have focused on chemical spectroscopy (vibrational spectroscopy and NMR), applied to the study of molecular structure (conformational isomerism, strong hydrogen bonding, inorganic complexes, and adsorbed species) and molecular dynamics (internal rotation and rotation in solution).

During the past 15 years his principal interest has been the evaluation of the structures of chemisorbed species on metal and metal-oxide surfaces of catalytic interest using infrared, Raman and electron energy loss spectroscopy as applied to finely divided catalysts and to metal single-crystals as models for metal catalysts.

Conferences

Pesticide Congress 1990

In the January issue of *CI* we stated that Dr Helmut Frehse is Chairman of the Organizing Committee of the 7th International Congress of Pesticide Chemistry to be held in Hamburg, FRG, August 1990 (see *CI* Vol. 9, No. 1, p. 21, 1987). Dr Frehse is, in fact, Chairman of the Scientific Committee of the Congress. Chairman of the Organizing Committee is Dr S. Gorbach. Apologies for this inadvertent error.

Dr S. Gorbach at the Pesticide Chemistry Congress in Ottawa, Canada, August 1986. Dr Gorbach is Chairman of the Organizing Committee of the next Pesticide Congress and a Member of the Applied Chemistry Division Committee.

Photochemistry

The 13th International Conference on Photochemistry will be held in Budapest, Hungary, 9–14 August 1987. *Further information from Dr Tamás Vidóczy (Secretary), Central Research Institute for Chemistry, H-1525 Budapest, POB 17, Hungary.*

Organic Chemistry

The 5th European Symposium on Organic Chemistry will be held in Jerusalem, Israel, 30 August–3 September 1987. The symposium will be devoted to the various aspects of:

- synthetic organic chemistry
- physical and theoretical organic chemistry
- bio-organic chemistry and natural products

Further information from: The Secretariat-ESOC V, PO Box 394, 61 003 Tel Aviv, Israel.

Princess Congress

The 1st Princess Chulabhorn Science Congress 1987: International Congress on Natural Products will take place in Bangkok, Thailand, 10–13 December 1987. The congress is organized by the Chulabhorn Foundation in co-operation with Mahidol University.

The scientific aim of this congress is to give an up-to-date picture of all aspects of development in natural products research with special emphasis on organic chemistry and drug development. The subjects will include:

- ethnopharmacology
- pharmacognosy
- chemistry of natural products
- utilization of natural products for development
- other related topics

For further information contact: Prof. Vichai Reutrakul, Scientific Secretary for Princess Congress I, Department of Chemistry, Faculty of Science, Mahidol University, Rama VI Road, Bangkok 10400, Thailand. Telex: 84770 UNIMAHI TH. Tel: 2458322.

6th International Conference on Fourier Transform Spectroscopy
Vienna, Austria, 24–28 August 1987

This conference will be held in the historic city of Vienna exactly 100 years after Michelson proposed that his interferometer could be used for spectroscopy. It also will be the 30th anniversary of the Bellevue (France) Colloquium 1957 which opened this conference series.

The Vienna Conference will cover developments in Fourier Transform Spectroscopy in the infrared, visible and UK spectral ranges. Theoretical and experimental aspects as well as applications will be included.

The venue of the conference is the Technical University of Vienna which is located in the city centre, close to the Vienna State Opera, the museums, concerts hall and other major sites of the city.

Scientific programme

The following are included in the preliminary list of plenary speakers: C. De Bergh (France), J. R. Birch (UK), J. W. Brault (USA), D. G. Cameron (USA), D. B. Chase (USA), P. Connes (France), J. W. Cooley (USA), C. B. Farmer (USA), P. Giamcomo (France), P. Griffiths (USA), E. E. Haller (USA), E. R. Huppi (USA), J. W. C. Johns (Canada), E. Knözinger (FRG), S. Minami (Japan), J. Mink (Hungary), L. A. Nafie (USA), A. Neckel (Austria) and G. Zerbi (Italy).

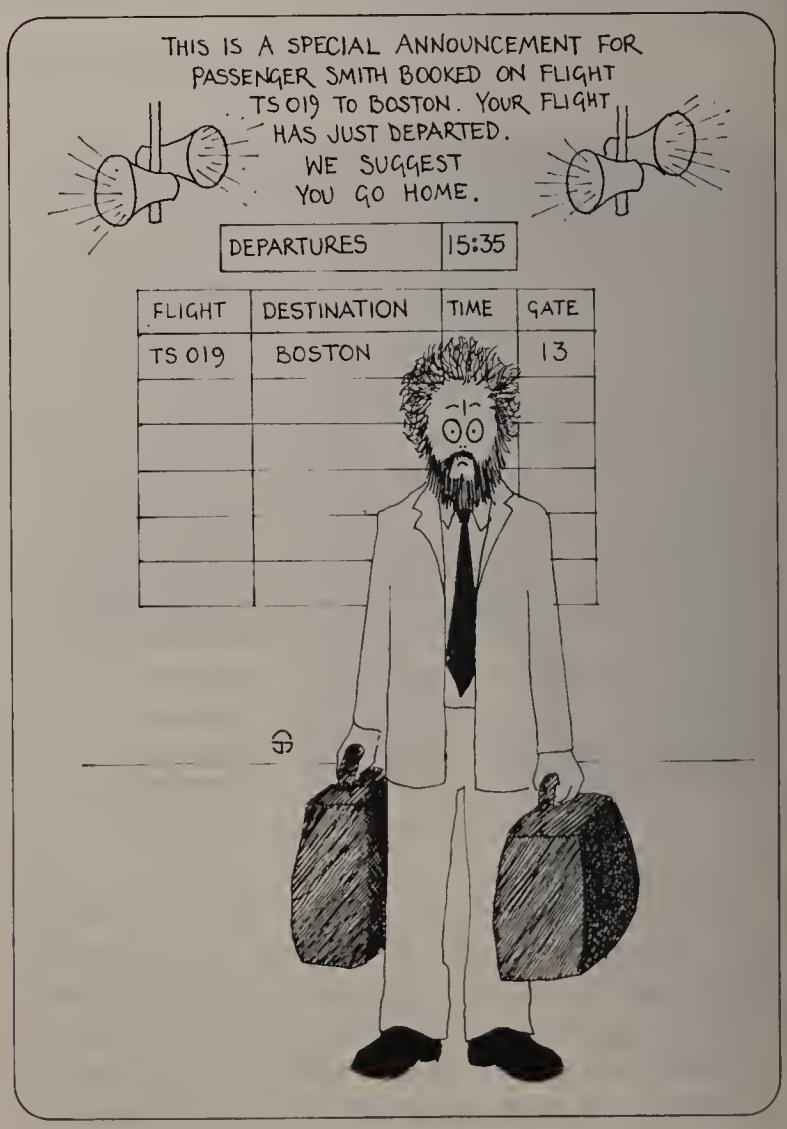
The programme will include the following topics:

- Instrumental methodology
- Cryogenic inteferometry
- Metrology, wave number and intensity standards
- Coupled techniques
- (GCIR, LCIR, Raman, laser induced fluorescence, . . .)
- Amplitude spectroscopy
- Time resolved spectroscopy
- Photo acoustics
- Diffuse reflectance
- Microscopy
- Data treatment
- High resolution
- Emission and absorption
- Vibrational intensities
- Atmospheric studies
- FTS in space science
- Semiconductors
- Polymers
- Surface studies
- Matrix isolation
- Solid liquid interfaces *in situ*
- Biological and biomedical studies
- Spectroelectrochemistry
- Automatic analysis (robotics)

The official language of the conference is English. No simultaneous translation will be provided.

The registration fee for regular participants before 1st July is AS 3.000, and AS 3.600, after. The fee includes participation in the scientific programme, a copy of the abstracts and the proceedings, and two receptions.

During August the average temperature in Vienna is about 20 °C. The weather is relatively dry although it is advisable to bring a raincoat. No formal dress is required to attend the conference or social events. However, most Viennese wear formal dress for the banquet.



8th International Symposium on Plasma Chemistry
Tokyo, Japan, 31 August–4 September 1987

The International Symposium on Plasma Chemistry (ISPC) originated in the historic meeting in Kiel, 1973. The symposium is recognized as one of the most important events in plasma chemistry. It will cover all aspects of the subject and bring together plasma scientists and engineers from all over the world.

ISPC-8, which will be held in the Keio Plaza Hotel in Tokyo, will cover the science, engineering and applications of both thermal and low pressure plasmas.

The topics are:

1. Modelling: (thermal) torch design, gas injection, heat and mass transfer, plasma flows (low pressure), elementary processes, gaseous electronics, plasma processing design
2. Diagnostics: thermal plasmas, low pressure plasmas
3. Synthesis: solid synthesis, pyrolysis, gas synthesis, ozoned synthesis
4. Thin film technology: etching, deposition, metallurgical and hard coatings, polymerization
5. Surface interactions: surface treatment, modifications, plasma–wall interaction
6. Plasma metallurgy: spraying, melting, evaporation, extractive metallurgy
7. Analytical chemistry: ICP, ashing, sample treatment

In addition, there will be sessions on the following special topics:

Amorphous silicon, diamond film, new ceramics, super structure, ultrafine particles, nanocrystalline material nano-patterning, ECR plasma, plasma initiated polymerization, biomedical applications, hybrid technology, quantum chemistry, plasma X-ray sources, metal organic compounds, metastable phases.

A one-day workshop on industrial developments in thermal and low pressure plasma technologies is also planned. There will also be an exhibition of equipment for plasma processing and diagnostics.

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1987

Macromolecules

30 June–4 July. 31st International Symposium on Macromolecules. Merseburg, GDR.
(Technische Hochschule "Carl Schorlemmer", Leuna-Merseburg, Macro 87, Otto-Nuschke-Strasse, DDR-4200 Merseberg, German Democratic Republic.)

Macromolecules

6–9 July. 30th Microsymposium on Macromolecules. Polymer-Supported Organic Reagents and Catalysts. Prague, Czechoslovakia.
(Dr P. Čefelin, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovskeho námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Bioinorganic Chemistry

6–10 July. 3rd International Conference on Bioinorganic Chemistry. Noordwijkerhout, The Netherlands.
(Prof. J. Reedijk, State University Leiden, Gorleaus Laboratories, PO Box 9502, NL-2300 RA Leiden, The Netherlands.)

Macromolecules

13–16 July. 10th Discussion Conference on Macromolecules. Small-angle Scattering and Related Methods. Prague, Czechoslovakia.
(Dr P. Čefelin, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

IUPAC Congress

13–18 July. 31st International Congress of Pure and Applied Chemistry. Sofia, Bulgaria.
(31st International Congress of Pure & Applied Chemistry, Centre of Chemistry, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Block 11, 1040 Sofia, Bulgaria.)

Heteroatom Chemistry

19–24 July. International Conference on Heteroatom Chemistry (ICHAC-1987). Kobe, Japan.
(Prof. Michio Kobayashi, Secretary, ICHAC-1987, c/o Kinki Chemical Society, 1-8-4, Utsubo-Honmachi, Nishiku, Osaka 550, Japan.)

Macrocyclic Chemistry

20–23 July. 12th International Symposium on Macrocyclic Chemistry. Hiroshima, Japan.
(Prof. Eiichi Kimura, Institute of Pharmaceutical Sciences, Hiroshima University School of Medicine, Kasumi 1-2-3, Minami-ku, Hiroshima 734, Japan.)

Organometallic Chemistry

26-30 July. 4th International Symposium on Organometallic Chemistry Directed Towards Organic Synthesis (OMCOS IV). Vancouver, BC, Canada.
(Prof. Michael D. Fryzuk, Department of Chemistry, The University of British Colombia, 2036 Main Hall, Vancouver, British Columbia, Canada V6T 1Y6.)

Chemical Education

26–31 July. 9th International Conference on Chemical Education. Sub-title: "Chemistry for our New World". São Paulo, Brazil.
(Prof. Ernesto Giesbrecht, Instituto de Quimica, Universidade de São Paulo, Caixa Postal 20.780, 01498–São Paulo, SP, Brazil.)

Coordination Chemistry

26–31 July. 25th International Conference on Coordination Chemistry. Nanjing, China.
(Prof. Xiao-Zeng You, Conference Secretary, XXV ICCC, Coordination Chemistry Institute, Nanjing University, Nanjing, Jiansu Province, China.)

Solute–Solute–Solvent Interactions

9–14 August. 8th International Conference on Solute–Solute–Solvent Interactions. Regensburg, Federal Republic of Germany.
(Prof. J. M. G. Barthel, Institut für Physikalische und Theoretische Chemie, Universität Regensburg, Universitätstrasse 31, D-8400 Regensburg, Federal Republic of Germany.)

Cationic Polymerization

10–14 August. 8th International Symposium on Cationic Polymerization and Related Processes. Munich, FRG.
(Prof. Oskar Nuyken, Lehrstuhl I für Makromolekulare Chemie, Universität Bayreuth, D-8580 Bayreuth, Federal Republic of Germany.)

Theoretical Organic Chemistry

12–19 August. World Congress of Theoretical Organic Chemists. Budapest, Hungary.
(E. A. Lang, WATOC Congress, Hungarian Chemical Society, H-1061 Budapest, Anker Köz 1, Hungary.)

Polymers for Advanced Technologies

16–21 August. International Symposium for Advanced Technologies. Jerusalem, Israel.
(Dr Steven Daren, IUPAC International Symposium on Polymers for Advanced Technologies, POB 50432, Tel-Aviv 61500, Israel.)

Trace Elements

17–21 August. 2nd Nordic Symposium on Trace Elements in Human Health and Disease. Odense, Denmark.
(Trace Elements in Human Health and Disease, Odense Tourist Association, Conference Department, The Town Hall, DK-5000 Odense C, Denmark.)

Thermal Analysis

23–28 August. 4th European Symposium on Thermal Analysis and Calorimetry. Jena, GDR.
(Prof. A. Feltz, Sektion Chemie, Friedrich-Schiller-Universität, DDR-6900 Jena, Steiger 3, GDR.)

Fourier Transform Spectroscopy

24–28 August. 6th International Conference on Fourier Transform Spectroscopy. Vienna, Austria.
(6th FTS Conference 1987, c/o Interconvention, PO Box 80, A-1107 Vienna, Austria.)

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan.
(Dr T. Yoshida, The University of Tokyo, Department of Metallurgy and Materials Science, Faculty of Engineering, Bunkyo-ku, Tokyo 113, Japan.)

Vapor–Liquid Equilibria

9–10 September. 3rd International Workshop on Vapor–Liquid Equilibria in 1-Alkanol + *r*-Alkane Mixtures. Budapest, Hungary.
(Dr H. V. Kehiaian, Laboratoire de Chimie Organique Physique, Institut de Topologie et de Dynamique des Systèmes, Université Paris VII — CNRS, 1 rue Guy de la Brosese, F-75005 Paris, France.)

Reduced conference fees for Affiliates

Organizers of the following conferences have agreed to a 10% reduction on conference fees for Affiliates:

- 31st International Symposium on Macromolecules (Merseburg, GDR, 30 June–4 July 1987)
- International Conference on Heteroatom Chemistry (ICHAC-1987) (Kobe, Japan, 19–24 July 1987)
- 9th International Conference on Chemical Education. Sub-title: "Chemistry for our New World" (São Paulo, Brazil, 26–31 July 1987)
- 25th International Conference on Coordination Chemistry (Nanjing, China, 26–31 July 1987)
- 8th International Conference on Solute–Solute–Solvent Interactions (Regensburg, FRG, 9–14 August 1987)
- World Congress of Theoretical Organic Chemists (Budapest, Hungary, 12–19 August 1987)
- 2nd Nordic Symposium on Trace Elements in Human Health & Disease (Odense, Denmark, 17–21 August 1987)

CHEMRAWN IV

4–9 October. Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources. Colorado, USA.
(Dr Derek W. Spencer, Associate Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1–5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubère, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-les-Nancy Cédex, France.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Poly(Vinyl Chloride)

18–21 July. 31st Microsymposium on Macromolecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(Dr P. Čefelín, Deputy Director, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto 606, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Nator, Maiji College of Pharmacy, 1-22-1, Tanashi-shi, Tokyo, Japan.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena, Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Department of Chemistry, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

Coordination Chemistry

29 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. J. de O. Cabral, Department of Chemistry, Faculdade de Ciencias, 4000 Porto, Portugal.)

1989

IUPAC CONGRESS

2–7 August. 32nd International Congress of Pure and Applied Chemistry. Stockholm, Sweden.
(Dr Bengt Karlsson, The Swedish Chemical Society, Wallingatan 26A, 5-111 24 Stockholm, Sweden.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds, Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Department of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

1990

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

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Written and compiled by **W. Wagner,** *Rühr Universität, Bochum, FRG,* and **K. Marjorie de Reuck,** *Department of Chemical Engineering and Chemical Technology, Imperial College, London.*

Published on behalf of the
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The main part of this book consists of tables of the equilibrium thermodynamic properties of oxygen for both the gas and liquid phases and along the saturation curve and the melting curve. The limits of the tables are 54k to 300k for pressures up to 80MPa. The properties listed are volume, entropy, enthalpy, isobaric heat capacity, compression factor, fugacity-pressure ratio, Joule-Thomson coefficient, ratio of heat capacities and speed of sound as functions of pressure and temperature; and pressure, entropy, internal energy and isochoric heat capacity as functions of density and temperature. The text gives a critical assessment of the accuracy of all the available experimental data and gives comparisons of the tables with the experimental data. The equations which were used to prepare the tables are given in a form suitable for computer programming.

Outline of Contents:

Introduction;
Experimental results;
The equation of state;
Auxiliary equations;
The IUPAC tables;
Appendix: Experimental results hitherto unpublished.

Autumn 1987. 256 pages, 27 illustrations. Cloth about £30.00
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Compendium of Chemical Terminology: IUPAC Recommendations

Available in both Hardback and Paperback

(The late) **V. Gold** formerly of King's College, London; **K.L. Loening,** Chemical Abstracts Service, Columbus, Ohio; **A.D. McNaught,** and **Pamil Sehmi,** both of the Royal Society of Chemistry, London

Published on behalf of the
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IUPAC

The credit for initiating this project lies entirely with the late **Victor Gold**, a Member of the IUPAC Interdivisional Committee on Nomenclature and Symbols (IDCNS). Owing to the availability of only limited resources, the original conception involved three stages, to be carried out under the auspices of IDCNS:

(a) identification of IUPAC documents containing suitable definitions,
(b) construction of an alphabetical listing of the terms defined with references,
(c) compilation of the present **Compendium**, involving editing and harmonization of material from different sources.

Victor Gold was able to complete only the first two stages and to begin the third before his untimely death on 29th September, 1985. The project was then completed by **Kurt Loening** and **Alan McNaught** with the support of the Royal Society of Chemistry. The compilation of entries was carred out by **Pamil Sehmi**, first at King's College, London, and then at the premises of the Royal Society of Chemistry.

This *Compendium* is then an alphabetical listing of terms used in chemistry, with the definitions recommended by various IUPAC commissions dealing with nomenclature and terminology. Terms from physical, inorganic, organic, macromolecular, and analytical chemistry published up to the end of 1985 are included. The book differs from other chemical dictionaries in that the definitions are truly authoritative, being recommendations agreed by committees of experts after consultation with the chemical community; it is intended to be ongoing as some important areas of chemistry have not yet been the subject of IUPAC recommendations and thus is therefore the first step towards a comprehensive and authoritative chemical dictionary. Available in both hardback and paperback.

Outline of Contents:

Alphabetical entries; References; Source documents.

Early 1987. 464 pages. Cloth £45.00, Limp £29.50.

ISBN Cloth 0 632 01765 1 Limp 0 632 01767 8

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 42 countries, each represented by a national organization, such as an academy of science or research council.

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Chemistry International

IUPAC

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Reproduction or translation of articles in this issue is encouraged, provided that it is accompanied by a reference to the original publication in *Chemistry International*, unless there is a footnote to the contrary.

Front cover: The Edgar Fahs Smith Memorial Collection at the University of Pennsylvania, USA. It is one of the world's foremost collections in the history of chemistry and chemical technology and is the base of the Center for History of Chemistry (CHOC).

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Editorial

Who supports whom?

As Affiliate Affairs Secretary and Information Officer I receive many letters from around the world. These often raise varied and interesting questions. Some I cannot answer and so I pass them on to the appropriate Commission or Committee Chairmen or Secretaries. Other questions relate to the Affiliate Membership Scheme. These seem to fall into two distinct categories:

Why should I become an Affiliate?

This question comes in various shapes and sizes. For example:

> "What can IUPAC do for me or my career?"
> "Why should I spend £11.00/US-$15.00 (or whatever) to become an Affiliate? I'm already inundated with paper and one thing I don't need is another magazine or journal to read."

Well, the benefits of affiliation to IUPAC have already been published a number of times, but are worth repeating. They include:

- Visibility as a potential recruit for the scientific work of IUPAC. Details of specific interests of Affiliates who completed and returned the blue Affiliate Registration forms last year have already been forwarded to the appropriate Commissions. This process will be repeated in due course.
- Six copies per year of the IUPAC news magazine *Chemistry International*. Here I would point out that in many countries the Affiliate subscriptions for both 1986 and 1987 were lower than the individual subscription rate for *CI* alone (see inside front cover opposite).
- Entitlement to communicate directly on scientific matters with Officers of IUPAC Commissions. A good example is found on page 193 of this issue where Prof. Daryle H. Husch, Chairman of the Commission on Nomenclature of Inorganic Chemistry (CNIC), specifically invites enquiries on problems involving nomenclature of inorganic compounds.
- A 25% reduction on the cost of all IUPAC publications except the scientific journal *PAC*. Earlier this year all Affiliates were sent a leaflet with more details of this benefit.
- A 10% reduction on registration fees of IUPAC sponsored conferences. This is now a condition of IUPAC sponsorship.

In the context of these benefits I would like to draw attention to the following statement which appears in the *CNIC 1987 Newsletter* (see p. 193):

> "CNIC is a unit of an international public service organization, IUPAC, and we are volunteer chemists from around the world."

The Affiliate benefits described above have been agreed and negotiated by such volunteer chemists. These chemists volunteer their work, time and energy freely. IUPAC does not pay them. The Union may thus be regarded as an international community of chemists who help, support and cooperate with one another to promote pure and applied chemistry and who, through the Affiliate Membership scheme, aim to maximize the involvement and interest of other chemists in their work.

The second question which often crops up in the letters I receive is opposite to, and I think, more important than the first question. This question is:

Opinions expressed here are those of the author and do not necessarily reflect the views or policy of IUPAC.

How can I support the Union?

Unfortunately not all Affiliates will be able to become members of IUPAC Commissions and Committees. Indeed, the number of opportunities is very limited. About 1500 volunteer chemists work on IUPAC's various Committees and Commissions — yet there are already 7000 Affiliates.

However, the very act of becoming an Affiliate is itself an act of support for the Union. By becoming an Affiliate a chemist not only supports IUPAC, he or she also supports and helps to promote the objectives of the Union. These are detailed in the box on the inside back cover of *CI*. They include the promotion of cooperation among chemists from member countries. What could be more worthwhile than supporting this objective?

On page 83 of the previous issue of *CI* we quoted Prof. H. R. Kruyt, IUPAC President 1947–1951:

"We need morals and brotherhood to avoid science becoming a curse."

This is perhaps one of the most important reasons for becoming an Affiliate and, thereby, supporting the Union.

News & Views

New science programmes in Asia

At the ICSU General Assembly in Berne, Switzerland, 1986, the Federation of Asian Scientific Academies and Societies (FASAS) was admitted as a 'Scientific Associate' of ICSU. There followed a meeting in Beijing when the following programmes for 1987 were approved for joint sponsorship of FASAS and other international agencies:

- Seminar on Agroforestry together with an Asian Science and Technology Conference, Kuala Lumpur.
- Workshop on Climate Change and Water Resources, Shanghai.
- International Conference on New Engineering Materials, Madras.
- Conference on Climate and Food Security, New Delhi.
- First Asian School on Conservation Biology, Ootacamund, India.
- UNESCO Regional Seminar on Chemistry of Mangrove Plants, Bangkok.
- Research in Medicinal Plants, Dacca.
- Instrumentation for Chemical Analysis, Singapore.
- Natural Products Chemistry and Chemical Instrumentation in Science Education, Khatmandu.

FASAS will also publish, with the help of other agencies, a new science periodical from Asia. This is in addition to the *FASAS Newsletter*.

The founding of the Federation resulted from the deliberations of delegates of the Federal Science Academies and Science Societies of Afghanistan, Bangladesh, China, India, Malaysia, Nepal, Pakistan, Singapore, Sri Lanka and Thailand, who met in New Delhi on 15–16 November 1983, for a Workshop on the 'Role of Scientific Societies and Academies in National Development'. The meeting was organized by the Indian National Science Academy (INSA) in association with the Committee on Science and Technology in Developing Countries (COSTED) of ICSU. Discussions were held on some of the major problems faced by countries of the Asian region, namely, energy, environment, health care and population control, scientific and technical manpower and training and resource planning. It was recognized that Asian countries faced common problems. Delegates also presented country reports, describing the state of science and technology in their countries and their experiences in tackling problems of development.

At a special session, the delegates discussed the formation of an organization linking societies and academies of science and technology in Asia, and the Federation established on 16 January 1984, as the outcome of this proposal.

The Federation is a non-governmental science organization of the Asian region, composed of 11 science academies and societies as National Members. Its principal objectives are the advancement of science and technology and the organization of national and regional programmes for the development of Asian countries. The Federation desires to maintain close liaison and work in cooperation with international governmental and non-governmental

An International Conference on New Engineering Materials, in Madras, was one of the FASAS sponsored activities for 1987. This photograph shows an operator and trainee boring a plastic mould with a jig boring machine at the Central Institute of Plastics Engineerings and Tools (CIPET) in Madras. The Institute trains mould designers, mould makers and tool and die makers for the Indian plastics industry and also holds short courses for technicians and mould polishers. It also provides advisory services for industry. (*Photo courtesy ILO.*)

organizations in the furtherance of its objectives, both in terms of south–south and south–north cooperation.

Since its inception, it has already conducted several programmes including Enzyme Engineering Technology, Resource Survey and Monitoring, Training Programmes on Photovoltaic Energy Systems for Energy Application, Role of Science and Technology in Planning, Microcomputer Interfacing to Instruments, workshops on Alternate Energy Avenues on Rural Areas, Genetic Engineering and Biotechnology, Pharmaceutical Techniques for Evaluation of Medicinal Plants and Asian Conference for Rural Development. At present, it is executing its programmes on a limited scale, the travel fund for the participants is being provided by COSTED and hospitality by the host country.

More information about FASAS is available from: Professor A. K. Sharma, Centre for Advanced Study, Department of Botany, University of Calcutta, 35 Ballygunge Circular Road, Calcutta 700 019, India.

First meeting of biotechnology committee

The International Council of Scientific Unions' (ICSU) General Assembly at Berne, Switzerland in September, 1986 established an International Scientific Committee for Biotechnology (COBIOTECH) and provided initial core funding (see *CI*, Vol. 9, No. 2, p. 55, 1987). The terms of reference for COBIOTECH are contained in a report of the ICSU Ad hoc Study Group on Biotechnology and in a draft constitution. COBIOTECH has the goal to serve as a focal group for the promotion of biotechnology for the benefit of humankind and to provide information and advice on biotechnology for the international community as a whole.

The initiative for establishing COBIOTECH arose among scientists actively engaged in biotechnology and from disciplinary, regional and international organizations concerned with the field. They recognized the interdisciplinary nature of biotechnology which involves the basic sciences, as well as engineering, industry, agriculture and medicine. They also recognized the role of ICSU to relate science to society and the special concern of ICSU for developing countries.

COBIOTECH is to serve as a clearing house for information on biotechnology-related activities such as meetings, courses, fellowships, culture collections, data banks, governmental regulations, international projects, standards and nomenclature.

The Committee is also to function in an advisory role, evaluating biotechnology projects on request from national governments or international institutions and presenting the opinion of the scientific community to the public sector in matters that affect biotechnology.

A third main function of COBIOTECH is to stimulate activities that result in international cooperation, such as the organization and sponsorship of scientific meetings, conferences for public education, workshops on specific topics, and laboratory training courses. The Committee also is to issue appropriate publications.

COBIOTECH is to work in close collaboration with other ICSU scientific bodies and national members, as well as with outside scientific and industrial organizations having an interest in biotechnology internationally.

An Interim Steering Group was appointed consisting of Jorge Allende (Chile) and Philipp Gerhardt (USA) as Co-Convenors, Isao Karube (Japan) and Manfred Ringfeil (GDR), Chairman of the IUPAC Commission on Biotechnology (1985–1987).

The Interim Steering Group prepared the agenda for the first meeting of COBIOTECH, invited interested ICSU and non-ICSU bodies to designate a representative to COBIOTECH, initiated certain activities in 1987, and has begun to raise additional interim funding. The Group met on 2–3 February 1987, at the International Centre for Genetic Engineering and Biotechnology of the United Nations Industrial Development Organization in Trieste, Italy.

An organizational first meeting of the full international Scientific Committee for Biotechnology was held on 13–14 June 1987, just before the European Congress on Biotechnology at Amsterdam, The Netherlands. COBIOTECH convened at the International Centre of the Royal Tropical Institute.

Consequences of the Chernobyl accident

At the National Conference on Energy in Rome, Italy, on 26 February, Dr Blix, Director General, International Atomic Energy Agency (IAEA), said that nearly a year of analysis and data collection is beginning to give "a more factual picture of the dimension" of the Chernobyl accident and its health and environmental consequences. He emphasized that Chernobyl's health and environmental consequences, although severe, will be far lower than many people have been led to believe. Based on information reported by European countries to the IAEA and to the World Health Organization (WHO), he said "it would be reasonable to conclude" that the health consequences of Chernobyl outside the Soviet Union "will be so small that they will not be measureable or even identifiable." This contrasted sharply, he suggested, with early perceptions, which he said were based in part on the fallout pattern of radiation releases, media reports, and the widely varying national responses that tended to raise unnecessarily public fears and concerns.

He said that there appears to be growing awareness of the "realities" of nuclear power. Public opinion of nuclear power "seems to be moving away from the negative extremes" as people begin to place the accident at Chernobyl into perspective. "Although it will undoubtedly take time before our first media-made image of Chernobyl is replaced by a more accurate one, the very full, frank, and authoritative information we have received about the accident has helped correct some misunderstandings and allay some fears," he said. "What is more, it has prompted new initiatives in the field of nuclear safety."

Blix said, "After the stunning shock of Chernobyl and a period of reflection I am convinced that for economic and environmental reasons there will be a renewed demand for nuclear power". In describing the positive dimensions of nuclear power, he noted that 30% of the electricity in Western Europe is generated by nuclear plants, a factor that has helped to curb pollution and stabilize electricity prices. "Maintaining and further developing nuclear power is clearly of relevance for the economic competitiveness of these countries," he said. He noted that the Chernobyl accident created a need "to establish a new record of safety and excellence in performance for the nuclear power industry." Responding to this need, the Soviet Union has introduced safety-related design modifications for existing plants. Other countries have analysed the accident and are applying a number of improvements to their own plants.

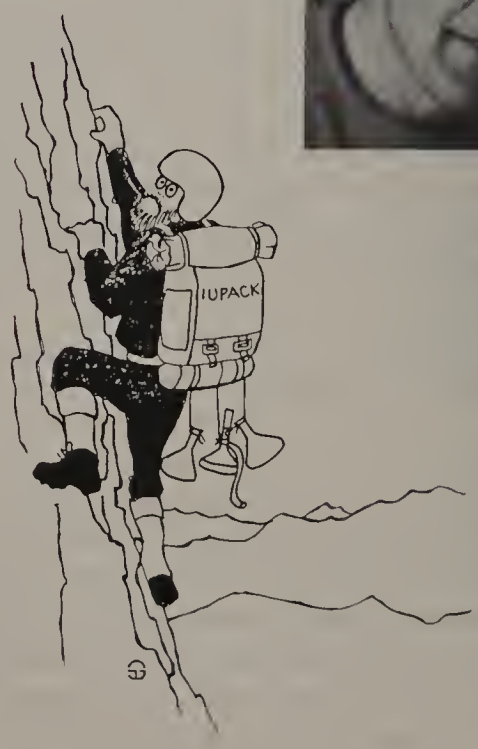
"A conspicuous feature of Chernobyl was its international dimension and the international measures it prompted in the field of safety. It was realized very clearly that a radioactive cloud does not respect national borders. There must be emergency assistance to bring accidents under control and adequate rules about reactor safety everywhere to ensure that large-scale accidents of this kind do not occur again and there must be some international assurance that such rules are respected! The IAEA is playing a central role in this work and considerable results have already been achieved. It is tragic that an accident like Chernobyl should be needed to produce proposals and acceptance of additional safety measures. It is positive, however, that measures are now being identified, developed and taken to further strengthen nuclear safety," he added.

We regret to record the death of:

Dr S. G. Mason, Canada (21 April 1987) — Commission on Colloid and Surface Chemistry including Catalysis (1979–).

Dr A. P. Tulloch, Canada (15 February 1987) — Commission on Oils, Fats, and Derivatives (1980–).

Congratulations to Steve Johnston who has drawn most of *CI*'s cartoons over the last two years. He has recently been appointed Head of the Department of Art at Cranbourne School, Basingstoke, UK.



Prof. Heinrich Zollinger, IUPAC President from 1979 to 1981, retired from Eidgenössische Technische Hochschule (ETH), Zürich, Switzerland on 31 March this year. He presented his official farewell lecture at ETH on 27 January. One hundred and sixty people including former coworkers and graduate students, secretaries, post-doctoral fellows and professors from around the world attended his farewell party in Lucerne (see above). Prof. and Mrs Zollinger are seated on the steps in front of them.

Letter to the Editor

Ourisson's Law and another message to all Commissions

Sir,

I have no first-hand knowledge of the effect of the application of Ourisson's Law (*CI*, Vol. 9, No. 2, p. 67, 1987) on the detailed work of the Union as it was propounded after I ceased active work in my Division, but I should like to draw the attention of Commissions to an extract from an old by-law, referring to the election of Commission members, adopted in 1949. It has been diluted out of all recognition in the current B 4.304 (at the end of the second paragraph).

The extract reads: "*Ils doivent avoir le désir et les possibilités de réserver suffisamment de temps aux activités de la Commission.*"

This is what I would have stressed (but not in French, my pronunciation is not good enough) had I known about it — it is surely the overriding consideration for efficient and effective Commission work. No matter how young or feminine, of whatever nationality or affiliation a Commission member is, if she doesn't answer letters or produce draft reports in good time she won't be much use to the Union.

I was, incidentally, interested in the statistics in your Editorial. Is 63 out of 1500 all that bad? Surely

Roger Fennell: "Old Bylaw has been diluted out of all recognition".

without a comparative figure of the ratio of females to males in the 42 member countries who are expert in their IUPAC-related fields, meaningful comment on the level of female involvement in the Union cannot be made — or has ICSU got some magic formula? For that matter, does anyone know the ratio of experts, of both sexes, below and over the age of 40?

Roger W. Fennell
Former Secretary, Division V

New National/Regional Centre in GDR

The following National/Regional Centre has now been added to the list published in *CI*, Vol. 9, No. 1, p. 27 (1987):

GDR
Prof. H. Schick,
Chemische Gesellschaft der DDR,
Nationales Zentrum fuer IUPAC
Nomenklatur and Symbole,
Clara-Zetkin-Strasse 105, PF 1327,
DDR-1086 Berlin, GDR.

Euro Food Tox II

The proceedings of the Euro Food Tox II Interdisciplinary Conference on Natural Toxicants in Food have now been published. The conference was held in Zürich, Switzerland, 15–18 October 1986 and co-sponsored by the IUPAC Commission on Food Chemistry, the Federation of European Chemical Societies (FECS) Working Party on Food Chemistry and the European Society of Toxicology.

Copies of the proceedings are available through the Chairman of the Working Group on Natural Toxins, Commission on Food Chemistry: Dr R. Battaglia, Kantonales Labor Zürich, Fehrenstrasse 15, Ch-8030 Zürich, Switzerland. Price Sw.fr. 25.00.

Spotlight on CHOC

Bruce V. Lewenstein

The Center for History of Chemistry is located in Philadelphia, USA. In this article CHOC's Public Education Officer, Bruce V. Lewenstein describes how CHOC provides opportunities and resources for understanding chemistry, chemical engineering and chemical industries.

A new book on *Polymer Pioneers* is the latest offering from the Center for History of Chemistry (CHOC). The book, which provides a popular history of one of the most important areas of twentieth-century science and technology, is just one part of CHOC's attempt to make the history of chemistry more widely available.

Located in Philadelphia, CHOC provides a variety of resources and opportunities for those interested in the history of chemistry, chemical engineering, and the chemical process industries. CHOC's "core" programs include:

- a major oral history interview program;
- an extensive research collection of manuscript and printed sources;
- publications, including exhibition catalogues, information pamphlets, guides to historical resources, and "how-to" manuals for those just getting interested in history: and
- guides to historically significant manuscript and records collections of individuals, companies, academic institutions, and professional associations affiliated with chemistry.

CHOC also sponsors a series of special projects. The current project inquires into the development of polymer science and technology in the twentieth century. In addition to *Polymer Pioneers*, the project produced a travelling exhibition on "Polymers & People", which opened last autumn. The exhibition featured photographs, samples and a broad introduction to the economic, technical, and social context in which polymer science and technology developed.

Founded in 1982, CHOC is a joint endeavour of the American Chemical Society, the American Institute of Chemical Engineers, and the University of Pennsylvania, at which it is located. It is charged with discovering and disseminating information about historical resources and encouraging research, scholarship, and popular writing on the history of chemistry, chemical engineering, and the chemical process industries.

Not least among CHOC's resources are its Advisory Board and Policy Council, which include Nobel laureates Christian B. Anfinsen (Johns Hopkins University), Herbert C. Brown (Purdue University), and Glenn T. Seaborg (University of California), in

Historical inquiries

Members of the CHOC staff are always glad to assist with historical inquiries of all kinds. They can be reached by telephone (at +1 (215) 898 4896); by correspondence (to CHOC, 215 South 34th Street, Philadelphia, PA 19104-6310, USA); or by personal visit (CHOC is open five days a week from 9 a.m. to 5 p.m.). They encourage advice and suggestions, and questions regarding their growing resources in the history of chemistry, chemical engineering, and the chemical process industries.

Polymer pioneer Dr Herman Mark (right) during his oral history interview with Dr Jeffrey Sturchio.

CHOC director Dr Arnold Thackray (right) and associate director Dr Jeffrey L. Sturchio.

addition to leading chemists and chemical engineers such as William O. Baker (AT&T Bell Laboratories, retired), Albert Bowers (Syntex), Sidney Edelstein (Dexter Chemical), Robert C. Forney (Du Pont), Mary L. Good (Signal Research; ACS President), John C. Haas (Rohm and Haas), Ralph Landau (National Academy of Engineering), Gerald D. Laubach (Pfizer). Paul F. Oreffice (Dow), Charles C. Price (University of Pennsylvania), and P. Roy Vagelos (Merck).

CHOC's oral history programme is one of its most visible and valuable resources, for it provides a unique window on the development of modern chemistry and chemical technology. Interviews with Arnold O. Beckman, Carl Djerassi, Herman Mark, Vladimir Prelog, Tadeus Reichstein, Albert Eschenmoser, and Max Tishler are among the more than 50 already recorded for CHOC's collection.

From alchemy to zymurgy

For those interested in producing their own scholarship, CHOC's library and archival staff maintain the Edgar Fahs Smith Memorial Collection at the University of Pennsylvania, one of the foremost research libraries in the history of chemistry and chemical technology. The collection's more than 15 000 volumes of primary source material (including manuscripts) range from the fifteenth to the twentieth centuries and from alchemy to zymurgy. In addition, CHOC's collection of photographs, reprints, reference works, and historical literature provides a major reference source for the history of the entire spectrum of chemistry, chemical engineering, and the chemical process industries. CHOC regularly play hosts to visitors from abroad, including Great Britain, Italy, the Netherlands, West Germany, and Japan.

CHOC's archival staff also assist individuals and organizations working to preserve their own records. A second edition of a *Guide to Archives and Manuscript Collections in the History of Chemistry and Chemical Engineering* is about to go to press and CHOC staff members regularly consult with corporations and other organizations setting up archives. In 1985, CHOC sponsored a conference on corporate history, to which representatives of more than 20 major corporations contributed.

Finally, CHOC contributes regularly to the public understanding of chemistry and chemical engineering through publications, lectures, and exhibitions. These exhibitions visit science museums, schools, cultural centres, and industrial laboratories across the country. In addition to "Polymers & People", CHOC exhibitions on "Joseph Priestley, Enlightened Chemist" and on "Scaling Up" continue national tours.

CHOC publications range from its widely-distributed newsletter, *CHOC News* (which covers both CHOC activities and general news in the history of chemistry and chemical technology), to informational pamphlets (such as "Why Save Personal Papers?"), through reference guides (such as *Corporate History and the Chemical Industries: A Resource Guide*). Many of these publications, including *CHOC News* are free. To order them, write to CHOC Publications, Room BB (for address see Box).

Boiling superconductors

Prof. C. N. R. Rao

In January this year a major breakthrough occurred in the development of superconductors. Since then there have been rapid advances in this field — some of which have occurred in the laboratories of Prof. C. N. R. Rao at the Indian Institute of Science, Bangalore. Superconductors were amongst the major topics discussed at the recent CHEMRAWN VI Conference held in Tokyo. In his plenary lecture at the Conference, Rao changed from his prepared text to present an up-to-date report on the most recent developments in superconductors. *Chemistry International* asked him to summarize these developments.

Scientists have been trying for a very long time to synthesize materials which become superconducting at reasonable temperatures. By the end of 1986 — after three decades of research — the highest temperature reported was 23 K. This worked out to be an average increase of 3 K per decade.

Then, in January 1987, a major breakthrough occurred with the discovery of a set of compounds with the structure K_2NiF_4 and the general formula $La_{2-x}Sr_xCuO_4$. These materials showed zero resistance around 30 K and the onset of superconductivity at about 40 K.

"The discovery of superconductivity above liquid nitrogen (77 K) temperature is indeed staggering."

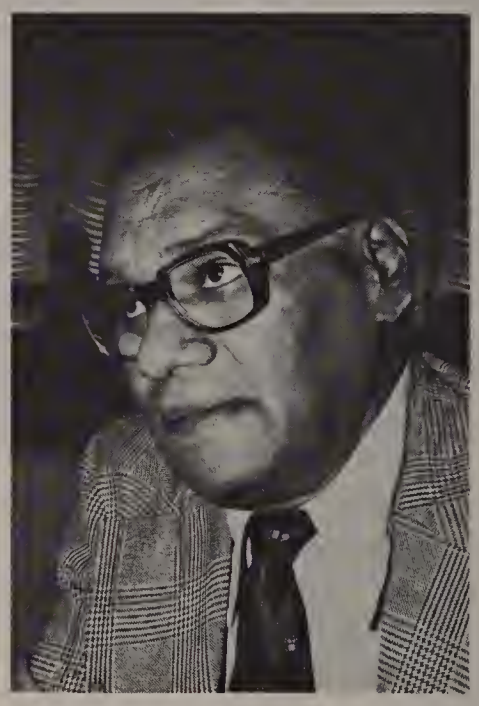
A bigger breakthrough came in March this year when an oxide of the formula $YBa_2Cu_3O_7$ possessing the perovskite structure was found to exhibit zero resistance between 90 K and 95 K. The discovery of superconductivity above liquid nitrogen (77 K) temperature is indeed staggering. It means that we now have the possibility of designing new powerful magnets and a variety of high-technology applications in transportation and energy.

Levitation transportation now becomes a likely possibility in the near future. In addition, the design of super colliders will now have to be re-examined in the light of the high-temperature superconductivity. Magneto hydro dynamic (MHD) generation of energy will be greatly facilitated by these superconductors. Finally, there will be many applications in defence areas such as radar.

One of the recent discoveries in our laboratories in India was that the oxygen atoms in these oxides play an essential role in the mechanism of superconductivity. We found that the holes are actually on the oxygen atoms rather than on copper. Hole–hole coupling gives rise to resonating oxygen–oxygen bonds which are responsible for the Cooper pairs. These superconductors are thus chemists' superconductors rather than the physicists' superconductors known for many years.

These materials have several curious features. They are poor conductors above the superconducting transition temperature. They are also very unusual with respect to absorption of electromagnetic radiation over a wide range of frequencies.

I feel that we now know enough about the mechanism of superconductivity and about the design and structure of these materials to prepare newer materials with very high-temperature transitions. There are even indications of materials which may become superconducting around 250 K or higher.



Prof. C. N. R. (Ram) Rao, IUPAC President from 1985 to 1987 at CHEMRAWN VI, Tokyo, May 1987.

The CHEMRAWN VI Conference on Advanced Materials for Innovations in Energy, Transportation and Communications was held in Tokyo in May 1987. A full report of the conference will appear in the next issue of *CI*.

Russian translation of CHEMRAWN II

Proceedings of CHEMRAWN II have been translated by T. V. Eremenko and S. A. Maslova under the editorship of G. E. Zaikov. The proceedings include the invited papers presented at the CHEMRAWN II International Conference on Chemistry and World Food Supplies: The New Frontiers, held in Manila, Philippines, 6–10 December 1982. The Russian translation is published by MIR Publishing House, Moscow, 1986.

Secretary General's Column

Biotechnology, labelling the long form of the Periodic Table, membership of IUPAC, CHEMRAWN and the structure of the Union were amongst the topics discussed by the Executive Committee when it met in Veszprém, Hungary, earlier this year.

The Executive Committee of the Bureau met in Veszprém, Hungary, on 26–27 April to prepare business for the 34th General Assembly of the Union, to be held on the campus of the University of Boston, USA, 21–29 August this year. In fact, by the time this column is published the Assembly will have met and taken decisions on many of the issues which were of concern to the Executive Committee.

First of all, however, it is a pleasure to acknowledge the arrangements made by the Hungarian Academy of Sciences, which placed the Academy House at Veszprém at the Union's disposition during the meeting. Prof. Erno Pungor, Chairman of the Hungarian Committee for IUPAC and a prominent member of the IUPAC Division of Analytical Chemistry (V), was our host, ably assisted by Dr E. Juhasz, an active member of the Division of Physical Chemistry. In Veszprém, the Executive Committee members were able to pay a short visit to Prof. J. Inczédy's (Division V), Department of Analytical Chemistry at the University, and there was a short but enjoyable excursion to the Tihany peninsula at Lake Balaton to allow members of the Committee to get some fresh air between sittings.

Chemistry at biological and medical interfaces

The interfaces between chemistry and medicine and between chemistry and the biological sciences are growth areas where there is fairly intense activity at the present time. In the former case, for example, the use of computers in drug design is a prominent joint concern of the two disciplines and in the latter, the biological manipulation of living organisms to produce specific chemical reactions or products is another.

Members of the Executive Committee relax with Hungarian and Russian colleagues at Tihany, Lake Balaton.

In times gone by, IUPAC has had an interest in 'classical' biotechnology in the form of a Commission of the Applied Chemistry Division (VI) largely in the area of industrial fermentation, that is, the more or less traditional area of the brewing and baking industry. Similarly, medicinal chemistry constituted a Commission of the Division of Organic Chemistry and was concerned largely with classical remedial molecular topics. Internal review forces within IUPAC and external influences led at the 1985 General Assembly in Lyon (France) to reformulation of both Commissions — Biotechnology once more, at least for the present, as a Commission of the Applied Chemistry Division, but with a request to evolve a modern biotechnological programme and Medicinal Chemistry as a subject for definition, within the IUPAC framework, by a six-strong Provisional Section Committee.

President Rao, Dr E (BANDI) Juhasz (Secretary, Hungarian National Committee for IUPAC) and Secretary General West.

The Executive Committee in Veszprém was pleased to see considerable progress on biotechnology reported by Commission Chairman Manfred Ringpfeil (GDR) and Division President Philip Kearney (USA). Recommended terms of reference focus on the applied aspects of industrial biotechnology, principally the chemistry of microbial production, with natural or bioengineered micro-organisms of products of agricultural, chemical or medicinal significance.

Within this context the Commission proposes to

be involved in gene manipulation at one end of the spectrum of its work and in the conversion of potentially toxic industrial wastes to environmentally acceptable products at the other. It will also be concerned with biotechnological terminology for scientists at laboratory level, with governmental regulations concerning biotechnology at national level and, at international level, with technology transfer to developing countries so that they may also reap the potential benefits of this relatively new area of chemical endeavour. Some tentative projects have been prepared and potential project leaders and participants identified.

It was noteworthy at the Lyon Assembly that many of the other IUPAC Divisions also expressed an interest in proposing biotechnology projects, and it will be equally interesting to examine their reactions to the proposals that will be made by Prof. Ringpfeil's Commission in Boston. The Commission itself does not propose to have a monopoly on biotechnology within IUPAC and welcomes the activity of other Commissions in the general area. It is interesting to speculate that the spread of Commissions on Biotechnology within Divisions other than VI might eventually lead to the formation of a Division of Biotechnology. It is also true to say that activity in Biotechnology within other Divisions will, for the present at least, occur at the expense of other activities.

The ICSU Assembly in Berne (1986) formed an inter-union Scientific Committee on Biotechnology (COBIOTECH), but only established it with a limited budget for two years to ascertain how it would fit in with other ICSU scientific committees active in this area (see p. 169). These are, for example, COGENE and CASAFA — respectively the Scientific Committee On Genetic Experimentation and the inter-union Commission on the Application of Science to Agriculture, Forestry and Agriculture and, of course, with scientific unions such as Biochemistry (IUB), Microbiological Sciences (IUMS), Biological Sciences (IUBS) as well as IUPAC, which latter has, of course, agreed to play a prominent part in COBIOTECH.

In the case of Medicinal Chemistry, the Executive Committee was less certain as to the suitability of the proposed terms of reference, chiefly in relation to overlap with the existing activities of other IUPAC bodies. Several points were formulated for consideration by the Provisional Section Committee before the Assembly in Boston.

Lest readers should be confused by the difference between a Commission, a Division and a Section, let me add briefly here that notionally a Commission is a task force committee of a Division with a specific objective within the purview of the Division and perhaps of only medium-term lifetime. A Division is usually composed of several Commissions and is concerned with a broad area of chemistry such as Analytical, Inorganic, Organic or Physical Chemistry, and is relatively long lived because of the broad nature of its responsibilities. A Section is basically a Committee — usually with a very limited number of Commissions or perhaps even none, where the Union recognizes a need for activity, but not at full Divisional Level. Like Division Committees, Sections report directly to the Council and the Bureau. Commissions report only to their Division/Section Committees.

Long-table nomenclature problems

As reported on a previous occasion (*CI*, Vol. 9, No. 2, p. 65, 1987), the periodic table and the way in which it is presented is a subject that generally raises the temperature in IUPAC discussions (and elsewhere!). This was not the case at Veszprém, where the Executive Committee maintained its usual even tenor of debate. It is, in practice, not so much the long form of the periodic table that causes difficulty amongst chemists in different parts of the world, but rather the sub-numbering or, more precisely, lettering of the families, that is, the principal European convention, for example, Ti,Zr:Group 4A and Ge,Sn:4B or the American convention Ti:4B; Sn:4A. Meanwhile, publication of the new edition of the 'Red Book' on *Nomenclature of inorganic chemistry* (see p. 191) which features the table is a matter of some urgency. The 'long form' was used in the previous edition and it may be that the 'short form' used in USSR and elsewhere also needs mention and the alternative family names in appendices to the 'Red Book'. To a non-inorganic chemist it might appear logical and unequivocal for enthusiasts of the long table to make reference to the 4-Sn or 4-Ti subgroups, but

no doubt the Commission on Nomenclature of Inorganic Chemistry (CNIC) has long ago considered and rejected such an idea.

More countries join IUPAC

The Executive Committee was pleased to consider applications for observer-country status within IUPAC from Jamaica and Saudi Arabia. In the former, the 'correspondent body' would be the Scientific Research Council, Kingston, and in Saudi Arabia, the National Centre for Science and Technology KACST (King Abdulaziz City for Science and Technology). This brings the number of full member and observer countries of IUPAC to 55.

Meanwhile the Affiliate Scheme, aided by ICSU and UNESCO grants for developing countries, has in the first three months of 1987 expanded the 1986 Affiliate Membership total from 5500 to over 7000. The Affiliate list covers 74 countries. New Affiliate countries are Bangladesh, Kuwait, Poland and USSR. Within 1.5 years the scheme has expanded the circulation of *Chemistry International* (*CI*) amongst the world's chemists from about 2000 to 9000. Our target is an eventual 12 000.

In accordance with the decision of the Council in Lyon, the Affiliate Scheme was launched in 1986 and by the end of 1987 will have been run with the aid of donations made by some member countries, ICSU and UNESCO. The Executive Committee decided in Veszprém, however, that it should recommend to the Bureau and Council that the Union should itself commit some funds to running the scheme in developing countries in 1988 and 1989, when the present ICSU/UNESCO subvention ceases and may not be renewed, although we will make representations for continued support.

CHEMRAWN achieves another outstanding success

The now famous CHEMRAWN (Chemical Research Applied to World Needs) Conferences are inexorably linked to the name of the CHEMRAWN Committee's first chairman, Dr Bryant Rossiter (USA). Although he himself would be the first to contradict me, there is absolutely no doubt that much, if not most, of CHEMRAWN's success is due to Bryant's phenomenal pioneering energy and drive (see *CI*, Vol. 8, No. 4, p. 6, 1986). CHEMRAWN, IUPAC and the social conscience of chemistry is greatly indebted to him in a way which no words of mine could begin to express. Sadly, according to the rules of office, his term as chairman of CHEMRAWN had to terminate at the end of 1986.

Dr Alan Hayes (UK) accepted taking the chair, but only temporarily because of his other commitments, whilst a new Chairman was sought. At Veszprém the President was able to announce that

Prof. J. M. Thomas, Chairman designate of CHEMRAWN Committee.

Prof. John Thomas, Director of the Royal Institution, London, had agreed to take up this office on behalf of the Union after the conclusion of the Boston General Assembly. It is a pleasure to welcome him to IUPAC and to wish him as much success in his appointment as his predecessor enjoyed.

As I write this Column, comments reaching me from Japan, where CHEMRAWN VI on "Advanced Materials for Innovations, Energy Transportation and Communications" has just finished, indicate that it has been phenomenally successful. It coincided with new research on "high-temperature" superconductors — one of the most exciting developments in scientific research of recent years. It is a matter of congratulation for Bryant Rossiter's Committee that just as they managed to mount CHEMRAWN I on organic raw materials at Vancouver during the oil crisis, they have once more achieved coincidence of CHEMRAWN and a definitive event.

An account of CHEMRAWN VI is due in the next issue of *CI* and subsequently the Union hopes to publish a uniquely significant book on the CHEMRAWN VI Conference. Readers are urged to keep a sharp lookout for both publications.

New financial support for IUPAC-sponsored symposia

In the past IUPAC has rarely granted financial support for the symposia it has sponsored. This has been a disappointment, particularly for developing countries. The Executive Committee is now considering a recommendation that there should in future be an automatic grant of US-$1000 to all IUPAC-sponsored symposia and that simultaneously the conditions governing publication by the Union of the proceedings of such symposia should be more closely regulated.

Structure of the Union

Readers may like to know that an *ad hoc* group appointed by the President at the Bureau meeting in Oxford in 1986 (see *CI*, Vol. 9, No. 2, p. 66 (1987)) to examine the structure of IUPAC, made its first draft report to the Executive Committee, which commented on it and asked for a redraft for the Bureau meeting in Boston.

Basically the discussion centres round whether or not the existing Divisional structure can be made sufficiently flexible to meet the changing needs of present-day chemistry, or whether it may be necessary to evolve a completely new and more mission-oriented structure.

It would be inappropriate to comment more on this matter pending further discussions, but there is a consensus in the Executive Committee that the Commissions or their successors in an alternative structure are likely to be set up for a limited lifetime in future, in order to allow more movement within the Union's programme or, to put it another way, to allow the Union to proact as well as react.

Miscellany

Invitations for 1991

In *CI*, Vol. 8, No. 3, p. 15 (1986), I called for invitations from the National Adhering Organizations to host the 1991 General Assembly and Congress. I am delighted to say that we have now received invitations for the Assembly from Greece, for the Congress from China, and for both the Assembly and Congress from Hungary. The 1989 Congress and Assembly will be held in Stockholm, Sweden (2–7 August), and Lund (9–18 August), respectively. Decisions on the venues for 1991 will be taken at the Council meeting in Boston.

History of IUPAC

The Executive Committee was pleased to note that Mr Roger Fennell is making progress with the proposed publication on the history of IUPAC. It will include material from 1919, when IUPAC was formed, up to the 1987 Boston General Assembly. It will also incorporate brief information on IUPAC's predecessor organization, the International Association of Chemical Societies. The book will be published by Blackwell Scientific Publications and is targeted for the General Assembly in Lund, when IUPAC will reach its 70th anniversary.

A muffled bang

On a personal note I must say I appreciate the cartoons which our Editor Mike Freemantle puts in these pages, particularly the recent one on page 64 of issue No. 2 this year. I cannot resist a riposte, however: whatever will IDCNS think of the nautical mile unit reported on the inside front cover of the same issue?

"EGÈSZSÈGÈRE".
Prof. Pungor and Prof. Rao.

The writer writ

Finally, returning to the Executive Committee in Veszprém and noting the "Verse to be Treasured" item on page 45 of the *CI* issue referred to above, I have to say that the Treasurer is an inveterate writer of limericks on Committee occasions. In Veszprém one of the other Officers, who prefers to remain anonymous, decided that the Treasurer himself should be honoured as follows:

Ode to the Treasurer at Veszprém

Anders Björkman's a very fine man
He writes poetry, plays music and plan-
-'s to control all our cash
he speaks with great dash,
but his greatest delight is CHEMRAWN

This Great Dane is three meters tall
Standing sideways y'can't see him at all
When he jogs every morning
He sings out like Björling
"IUPAC's assets are vanishing all"

He writes scurrilous verses 'bout Presidents
Though his scansion is sometimes quite incredibly
and even totally without precedents
But he always delights us
and helps us and trusts us
so we likes him and values his sentiments

The same budding poet expressed the thanks of the Executive Committee to Prof. Pungor and his colleagues for their hospitality in rhyme over dinner:

Erno Pungor's in Veszprém
Eggy Sheggy Rem Rem Rem
IUPAC's business has gone well
Thank you Bandi, thank you well
Now we raise our glasses full
Charged with bright red Blood of Bull
When can we come back again?
Eggy sheggy rem . . . rem, rem

Chemists, the world over, who have had the pleasure of drinking toasts of Bull's Blood with Hungarian friends, will, I am sure be able to understand the second and last lines.*

*EGÈSZSÈGÈRE with apologies to our Hungarian hosts.

Commission & Committee News

Affiliate interest in work of Biotechnology Commission

About 150 Affiliates have expressed an interest in the activities of the Commission on Biotechnology it was reported, when the Commission met in Basle, Switzerland in May this year. The Commission is contacting all these Affiliates and informing them of current activities.

The terms of reference of the Commission were agreed at the Basle meeting. The format of the symposium entitled "Biotechnology in Chemistry" and of an open meeting at the Boston General Assembly were also resolved.

The role of National Representatives to the Commission has been studied and efforts are being made to involve them in projects and feasibility studies.

Five projects are currently ongoing ("Glossary of biotechnological terms", Symposium entitled "Biotechnology in Chemistry", "Terms, Symbols and Units in Microbial Processes", "Interaction of Biotechnology/Organic Chemistry", "Single Cell Protein-Oil"). Four feasibility studies have been started ("Guidelines for Biotechnology", "Reactions Enhanced by Genetic Engineering", "Biophysical Chemistry" and "Methods for the Characterization of Anaerobic Bacteria").

G. G. Stewart

Water chemistry workshop

The Water Chemistry Commission (WCC) held its first workshop last October in Frankfurt, FRG. The Workshop, which was followed by a formal Commission meeting, was entitled "Removal of Chlorinated Hydrocarbons and Heavy Metals from Wastewaters by Advanced Treatment Systems."

The venue, Carl Bosch House, Frankfurt, was provided by courtesy of Gesellschaft Deutscher Chemiker (GDCh). Dr Fritsche welcomed the workshop participants on behalf of GDCh, and stated that GDCh have a Water Chemistry Division, comprising 750 members, that is active in environmental affairs.

The Workshop was designed to examine how sound effluent standards should be set, in order to design advanced treatment plants to treat effectively waste waters containing chlorinated hydrocarbons and heavy metals.

The programme comprised papers from Commission Members and international experts from outside the WCC. These external experts were Dr A. Huber, FRG; Prof. Hultman, Sweden: Dr L. Hartinger, FRG; and Mr D. W. Harrison, UK.

The titles of the presented papers were:

- Normal performance of treatment systems from a statistical point of view. How should sound effluent standards be designed?
  L. G. Lindfors, WCC
- Effluent — and discharge — standards; Chemical aspects.
  A. Huber, Bayer, FRG
- Removal of heavy metals in biological wastewater treatment plants.
  B. Hultman, VAV, Sweden
- Advanced methods in elimination of heavy metals.
  L. Hartinger, FRG
- Heavy metals and chlorinated hydrocarbons in digested sludge.
  F. Malz, Emschergenossenschaft, FRG
- Removal of chlorinated hydrocarbons in biological wastewater treatment plants.
  B. Hultman, VAV, Sweden
- Removal of chlorinated hydrocarbons by stripping/sorption processes.
  D. W. Harrison, ICI, England

Detailed discussions followed the paper presentations, and key issues were identified for referral to the subsequent Commission meeting.

The following points abstracted from the Workshop conclusions will be pursued by the Commission and will be detailed in the published proceedings of the Workshop:

1. Effluent standards should be based on long-term average values, and be expressed as 95-percentile values.

What is the environmental fate of heavy metals and chlorinated hydrocarbons in sewage sludges applied to soil? One of the questions at the Frankfurt Workshop.

2. Group parameters, such as AOX, should be used as an example of the "level" of pollutants in wastewater discharges, rather than as a standard for environmental protection.
3. Harmonized sampling and analytical procedures should be developed and used on an international basis.
4. The best way to control heavy metals in the environment is by establishing effective trade-effluent control policies, and using soundly-based consent limits on direct discharges.
5. Further efforts should be made to establish internationally agreed standards for the disposal of sewage sludges to agricultural land.
6. There is a need for further research into the environmental fate of heavy metals and chlorinated hydrocarbons in sewage sludges applied to soils.

Alan Tetlow

For a free copy of the proceedings please apply to the Information Officer at the IUPAC Secretariat.

Provisional Recommendations

IUPAC seeks your comments

All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* (*PAC*) and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres appeared in *CI*, Vol. 9, No. 1, p. 27 (1987) with additions in *CI*, Vol. 9, No. 3, p. 85 (1987) and on p. 172 of this issue.

The nomenclature of steroids (recommendations 1986)

The recommendations on nomenclature of steroids have a long history; the most recent recommendations were published in *PAC*, Vol. 31, pp. 285–322 (1972) and elsewhere. Since that time, many of the principles developed for naming steroids have been generally adopted and have become part of the IUPAC *Nomenclature of Organic Chemistry* (Pergamon Press, Oxford, 1979), in section F (Natural Products). The present document is a revision of the earlier recommendations made necessary in the light of new developments and current practice.

The main changes are as follows: (i) modifications, where appropriate to conform to section F; (ii) incorporation of the new recommendations (1981) for the nomenclature of vitamin D (*PAC*, Vol. 54, pp. 1511–1516, 1982) and elsewhere; (iii) wider use of the *R,S*-system for designating the stereochemistry in the side chain; (iv) provision of numbers for alkyl substituents; (v) procedure to fuse additional rings to the steroid; (vi) selection of homo or nor with the appropriate parent; (vii) selected International Non-Proprietary Names (INNs) for steroids; and (viii) the omission of most steroid alkaloid and steroid-like triterpenoids, as it is intended that they should be treated in an appendix to Section F.

Comments should be sent before 31 January 1988 to the Secretary of IUPAC–IUB Joint commission on Biochemical Nomenclature, Dr A. Cornish-Bowden, CNRS–CBH, BP 71, 31 chemin Joseph-Aiguier, F-13402 Marseille Cedex 9, France.

Nomenclature of thermal analysis: Part V — Symbols

The first four reports of this series contained recommendations for the classification and nomenclature of thermoanalytical methods, equipment and curves, with appropriate definitions. Many symbols are also used in thermal analysis for both quantities and units and, while many are generally accepted, some have varied, largely for disciplinal reasons. The present recommendations are framed to bring at least the most common symbols into line with IUPAC and SI recommendations, although a few concessions have had to be made to long-established usage.

Comments should be sent before 31 January 1988 to Dr R. C. Mackenzie, Chemistry Department, University of Aberdeen, Meston Walk, Old Aberdeen AB9 2UE, Scotland, UK.

Nomenclature and symbolism for mass spectroscopy

Mass spectroscopy is the study of systems by causing the formation of gaseous ions, with or without fragmentation, which are then characterized by their mass-to-charge ratios and relative abundances. The recommendations contained in this document refer to nomenclature relating to theoretical, technological and experimental aspects of the subject, and to the symbolism used when presenting and discussing mass spectral data.

The Commission on Analytical Nomenclature of IUPAC has previously issued recommendations for nomenclature of mass spectroscopy *PAC*, Vol. 37, pp. 469–480 (1974). These are in the form of definitions of some of the terms used in this subject. In 1978, the Commission on Molecular Structure and Spectroscopy up-dated and extended these recommendations and, in addition, made further recommendations concerning the use of symbols, acronyms, abbreviations and newly invented jargon *PAC*, Vol. 50, pp. 65–73 (1978). Because the subject continues to expand rapidly, a further compilation of defined terms has become necessary, and the opportunity has been taken to incorporate previous relevant recommendations concerning nomenclature and symbolism in order to produce a single comprehensive document. It is therefore intended that this set of recommendations should replace the earlier publications on the subject.

Comments should be sent before 29 February 1988 to Dr J. F. J. Todd, University Chemical Laboratory, University of Kent at Canterbury, Canterbury, Kent CT2 7NH, UK.

Quantities and units for metabolic processes as a function of time

Time-related measurements are performed in clinical chemistry for a variety of purposes, e.g. in assessing endocrine function by stimulation or suppression tests; to monitor physiological and pathological processes by following the excretion or secretion of components or by measuring catalytic activities of an enzyme in a system. The basis of interpreting and acting upon the test results lies in biochemical, physiological, pharmacological as well as pathological studies. Because of the different origins of such tests, and the varied applications to clinical situations, quantitative results have been presented in a variety of ways in clinical chemistry.

The aims of this document (prepared jointly by IUPAC Commission on Quantities and Units in Clinical Chemistry and IFCC Expert Panel on Quantities and Units) are: (i) to analyse the elements of the specifications for time-related measurements in the clinical laboratory; and (ii) to recommend a format that will unify, simplify, clarify and hence improve the reporting and understanding of time-related quantities measured in the clinical laboratory.

Comments should be sent before 29 February 1988 to Prof. G. Férard, Laboratoire de Biochimie Appliquée, Faculté de Pharmacie, Université Louis Pasteur, 74 route du Rhin, BP 10, F-67048 Strasbourg Cédex, France.

Nomenclature of inorganic chemistry (the Red Book): Revision of 2nd Edition (1970)

Chapter I-9: Oxoacids

This chapter provides a treatment of the nomenclature of oxoacids which is intended to be comprehensive and useful. The long history of the subject and the importance and widespread use of oxoacids nomenclature in teaching and industry warrant this extensive coverage. The approach followed is the preservation of the long-established practices while introducing systematization, whenever possible, based on the principles of coordination nomenclature.

The introductory section deals with historical considerations. A definition of an oxoacid is given followed by the principles of hydrogen nomenclature and their extension to all oxoacids and their functional derivatives (halogenides, anhydrides, esters, amides), with many examples. This represents a considerable expansion of the 1970 version of the *Nomenclature of Inorganic Chemistry* (Pergamon Press, Oxford, 1971). Then follows a description of acid nomenclature, which has the feature that the number of acidic hydrogens is not explicitly stated. Polynuclear acids are dealt with next. Except for special cases, this nomenclature is based exclusively on that of coordination compounds. A cursory account is given of the nomenclature of oxoanions (treated in detail in chapter I-8).

A description of the basic principles of the nomenclature of phosphorus and arsenic oxoacids (including substitutive, replacement and coordination nomenclatures) constitutes the second part of this chapter. This is included for the sake of

completeness, although it is discussed in detail in the IUPAC *Nomenclature of Organic Chemistry* (Pergamon Press, Oxford, 1979), where many of these oxoacids are also named as organic derivatives. Finally, a Table with many selected examples is provided for names of common oxoacids and their anions. There are five columns in the Table: formulae, traditional acid names, traditional anion names, hydrogen nomenclature and acid nomenclature. It illustrates the principles discussed in the chapter and thus provides a guideline for users.

Chapter I-11: Boron hydrides and related compounds

This chapter describes the idealized relationship in structural terms between the *closo-*, *nido-*, *arachno-*, etc., series of polyhedral polyboron clusters composed of triangular B-faces. Important practical exceptions to these principles are, however, given. Various nomenclature systems for boron hydrides and related compounds are described and compared (stoichiometric, semi-systematic descriptor names, and subtractive), including some delineation of stereochemical designation and numbering systems. Simpler examples of *commo*-linkage are given and a brief treatment of carboranes, metallaboranes, and metallacarbaboranes, and their derivatives provided. The chapter offers also a brief consideration of ions and radicals derived from these polyboron clusters.

This chapter is intended as an introductory treatment and avoids all description of the more complex structures incorporating capping, square faces, etc.

Comments on both chapters should be sent before 31 January 1988 to the Commission Secretary, Dr E. Samuel, Lab. de Chimie Organique Industrielle, École National Supérieure de Chimie, 11 rue Pierre et Marie Curie, F-75231 Paris Cédex 05, France.

Publications

Occupational and environmental chemical hazards

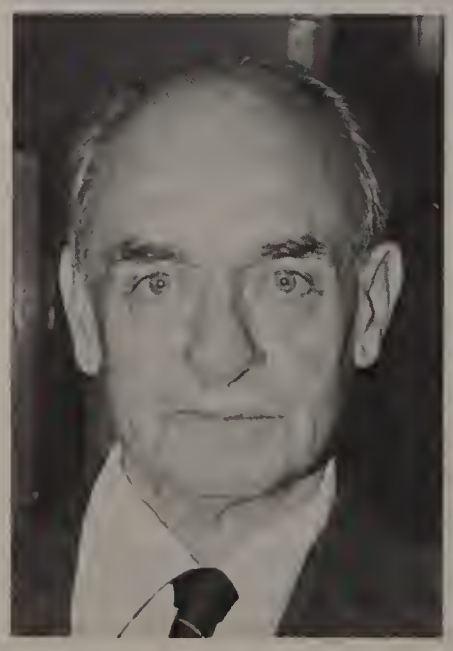
The widespread welfare and the increased life expectancy in the industrialized world are to a great extent due to the progress of science and production technologies and, in particular, of chemistry. This evolution, however, has also been responsible for a number of serious problems not only among the workers directly engaged in the productive activities but also in the population at large.

Cancer increase is one of the most striking and tragic phenomena and can in part be ascribed to altered environmental conditions.

Society and particularly the scientific community have never accepted that such problems should be considered an unavoidable toll to pay for this progress. Scientific research on toxicological risk has become well established just to give answers to such problems. Today the complex methodologies developed in the field can be considered themselves a separate and specialized discipline. While the techniques for controlling pollution and emissions from industrial plants into the environment have been greatly developed, many questions still remain in the evaluation of the health impact of chemicals on the human organism.

This gap of knowledge led the National Research Council of Italy to promote the special research programme "Toxicological Risk" within the framework of the national research project on Preventive Medicine and Rehabilitation in 1981. The special programme has funded the work of research groups throughout Italy.

Some of the results obtained from this programme were reported at the IUPAC sponsored International Symposium on Biochemical and Cellular Indices of Human Toxicity in Occupational and Environmental Medicine held in Milan 19–22 May 1986. At this symposium about 100 papers including several original papers from leading international research groups were presented to an audience of more than 240 scientists including



Dr W. N. Aldridge (UK), former Secretary-General of the International Union of Toxicology (IUTOX), who presented a paper on "Chemical and biochemical indices of changes in the nervous system" at a symposium on biochemical and cellular indices of human toxicity in occupational and environmental medicine.

toxicologists, occupational doctors and hygienists.

The symposium contributions published in *Occupational and environmental chemical hazards: cellular and biochemical indices for monitoring toxicity* well illustrate the state of the art on this subject and review the most recent progress in the field of surveillance and control of toxic effects induced in man by exogenous chemicals.

The book points to molecular targets and mechanisms of action of many environmental chemicals and also to the development of knowledge on the biochemical changes to those exposed to a variety of environmental or occupational pollutants.

It deals with the new indicators that are available in areas such as liver toxicity (enzyme induction and porphyrin metabolism), nervous system toxicity, nephrotoxicity, and genotoxicity, as well as the measurement of toxic substances in human tissues.

Each section covers an organ system or specific toxic effect, and is introduced by a state-of-the-art presentation by international scientists, who review the current basic knowledge, and critically assess the validity of the analytical methods involved. The authors discuss the usefulness and feasibility of introducing these indicators for health monitoring in various populations, and for assessing subtle effects of exposure. Particular emphasis is given to the issues concerning interpretation of results and the areas for future research.

The book is edited by V. Foá, E. A. Emmett, M. Maroni and A. Colombi and published by Ellis Horwood Limited, Chichester, UK, 1987. ISBN 0-7458-0088-2. Price £59.50.

Widening the Scope of Chemistry

IUPAC's Committee on the Teaching of Chemistry (CTC) has sponsored the International Conferences on Chemical Education (ICCE) to promote the greater development of chemical education at the international level. This volume from the 8th Conference held in Tokyo in August 1985 contains the plenary and invited lectures as well as short talks and poster presentations. The Conference was organized by IUPAC in conjunction with the Chemical Society of Japan and featured contributions from an international group of experts.

The areas covered by the lectures were:

- Chemical education and its surroundings
- Chemical education in the computer age
- Steps towards achieving the computer's potential
- Some examples of the use of artificial intelligence techniques in chemical education
- Chemical education for fostering future chemists of excellence
- Lessons from the past and prospects for the future of chemical education in Brazil
- The teacher as the key to excellence in chemistry
- The role of chemistry in biological education
- Education of chemists for future breakthroughs in medical sciences
- An approach to chemical education from the biological point of view
- What does industry expect from an education in chemistry?
- The teaching of industrial chemistry — widening the scope of high school chemistry
- Linking chemical education to industry — Korean experiences
- Chemistry education for everyone

The book is edited by Y. Takeuchi and published by Blackwell Scientific Publications Ltd, Oxford, UK, 1986. xi + 270 pp. ISBN 0-632-01537-3. Price £21.50/US-$34.50.

Mycotoxins and Phycotoxins

Mycotoxins and phycotoxins are toxins produced by fungi and algae, respectively. These hazardous substances play an important role in foodborne diseases of humans and animals.

Research on these toxins is multidisciplinary in nature. A monograph entitled *Mycotoxins and Phycotoxins* exemplifies this broad spectrum of interests. The book contains a collection of invited papers presented at the IUPAC sponsored 6th International Symposium on Mycotoxins and Phycotoxins held in Pretoria, Republic of South Africa, 22–25 July 1985 (see *CI*, Vol. 8, No. 6, pp. 9–15, 1986).

The volume contains contributions from scientists throughout the world on various aspects related to toxin research including: microbiology and genetics, biosynthesis, structural chemistry and mechanism of action and the role of toxins in human and animal health.

The book is edited by P. S. Steyn and R. Vleggaar and published by Elsevier Science Publishers B.V., 1986. xviii + 546 pp. ISBN 0-444-42632-9. Price US-$120.25/Dfl.325.00.

Noise Pollution

SCOPE Report 24: Noise Pollution, Effects and Control provides a comprehensive survey of the fundamental phenomena associated with the broad field of noise pollution and control. It is the first detailed reference source for researchers, drawing attention to the wide implications of noise pollution, and is designed to be used by workers in a variety of disciplines. The content is presented with the maximum scientific precision with the emphasis on the conceptual rather than mathematical aspects. The contributors are well-known international experts in the disciplines relating to this field. The content is up to date, well illustrated and uniform in presentation, and carefully chosen references are provided to enable the reader to pursue his particular field of interest.

This project has been supported by the Scientific Committee on Problems of the Environment (SCOPE), part of the International Council of Scientific Unions (ICSU), and has the approval and cooperation of the International Commission of Acoustics.

The book is edited by A. Lara Sáenz and R. W. B. Stephens and published by John Wiley & Sons, 1986. xix + 446 pp. ISBN 0-471-90325-6. Price: £49.50/US-$82.00.

The Greenhouse Effect

The problems of increasing atmospheric carbon dioxide concentrations and possible future climatic changes have attracted considerable attention in recent years. A number of assessments of this problem have been made by national groups, notably in the United States. The problem is clearly an international one and an assessment at the international level therefore seems desirable to serve as a basis for discussion and possibly, at some stage, for the development of an action plan.

SCOPE Report 29: The Greenhouse Effect, Climatic Change, and Ecosystems is aimed at serving such a purpose and is the result of an agreement between the United Nations Environment Programme (UNEP), the World Meteorological Organization (WMO) and the International Council of Scientific Unions (ICSU), the organizations which jointly implement the World Climate Programme.

In the assessment presented in this report the following major questions are considered:

- How much CO_2 has been and will be released into the atmosphere as a result of fossil-fuel combustion (Chapter 2)?
- What are the natural sources and sinks of carbon (the global carbon cycle) and what projections can be made of future atmospheric CO_2 concentrations (Chapter 3)?
- What are the expected increases of other greenhouse gases that affect the Earth's radiation budget (Chapter 4)?
- How will global and regional climates change as a result of increases in CO_2 and other greenhouse gases (Chapter 5)?
- When and how will climatic changes be detected? Is it possible to design climate scenarios which can be used for climate impact studies (Chapter 6)?
- What changes of sea level can be expected as a result of a warming of the atmosphere (Chapter 7)?
- What are the responses of terrestrial ecosystems to direct effects of an increased atmospheric concentration of CO_2 and climatic change (Chapters 8–10)?

For each one of these questions one or a few well-recognized scientists were asked to summarize present knowledge and, in doing so, also to present the main uncertainties and controversial opinions that exist. These contributions were exposed to critical reviews by panels of scientists in respective fields who expressed their views either during panel meetings, by correspondence or in direct personal contact with the authors. The aim was to arrive at analyses of the different aspects of the problem areas that describe current knowledge in a balanced and well-documented manner.

Chapter 1 addresses these more general problems based on the detailed presentations in Chapters 2–10. Such an analysis certainly can be written in many different ways depending on how present knowledge is evaluated. The present effort aims at giving a balanced overview and at indicating major controversies.

With these presentations as a background, the UNEP/WMO/ICSU International Conference on the Assessment of the role of carbon dioxide and of other greenhouse gases in climate variations and associated impacts at Villach, Austria, in October 1985 (*see CI*, Vol. 9, No. 3, p. 102, 1987) was devoted primarily to discussions of

- How to deal with the major uncertainties in our factual knowledge base, which will probably not be significantly altered until a change has been observed.
- The nature of international collaboration and action that might be necessary now, on the basis of present knowledge, or later, when more information has become available.
- Research priorities to provide the best possible knowledge about the results of man's future exploitation of his natural environment and their impact on climate on Earth.

Included in the present volume is also the Conference Statement from the conference at Villach. This aimed at serving the nations of the

world and the international organizations concerned in their further attending to the problem of possible future man-induced changes of the global climate.

SCOPE Report 29 is edited by Bert Dolin, Bo R. Döös, Jill Jäger and Richard A. Warrick and published by John Wiley & Sons, 1986. xxxi + 541 pp. ISBN 0-471-91012-0. Price: £56.00/US-$95.00.

Nutritional Sciences Directory

The International Union of Nutritional Sciences (IUNS) have published a *Directory 1986–1990.* This 94-page booklet contains general information about IUNS, statutes and rules of procedure and details of adhering bodies, affiliated bodies, commissions, committees, working groups and IUNS publications.

For further information contact: Riekie Janssen, Executive Secretary, c/o Dept. of Human Nutrition, Agricultural University, De Dreijen 12, 6703 BC Wageningen, The Netherlands. Tel: +31 8370-82589. Telex: 45015.

100 years of international standardization

Standardization has been a part of organized society from the beginning, and it has always been the prerogative of kings and emperors to establish standards of weight, measure and coinage. Standards for these and other public welfare purposes continue to exist; their importance is undiminished, and their compulsory nature is unchanged.

The concept of non-compulsory, voluntary standards established and applied by professional groups is a more recent historical development. Early national standards of this kind were aimed at rationalization in engineering industries, and the earliest international efforts appear to have been directed towards testing of materials.

One of the first steps in the history of modern international efforts to achieve voluntary industrial standardization appears to date back to September 1886, when records of an international conference in Dresden show that North Americans and Europeans met to discuss the need for common standards for testing materials under the leadership of Johann Bauschinger, a professor of Mathematics and Graphic Statics at the Munich Institute of Technology.

This conference, during which Bauschinger's concept of a truly international voluntary association of persons having the widest variety of views and interests took form, constituted an innovation of great importance: a new approach to meet the pressing requirements for international collaboration in science, industry and trade.

Mr Olle Sturen (Sweden), ISO Secretary-General from 1968 to 1986.

In September 1986 the International Organization for Standardization (ISO) commemorated the Dresden conference and the following 100 years of modern international standardization at a special ceremony in Geneva, Switzerland. At this ceremony five speakers made presentations each covering 20-year periods and the major landmarks in the international standardization movement over the last 100 years.

These five presentations together with an address by Mr O. Sturen, Secretary-General of ISO from September 1968 to April 1986, are published in a booklet entitled *100-Year Commemoration for International Standardization.*

The publication (ISBN 92-67-10131-5) is available in either English or French from: International Organization for Standardization, Case postale 56, CH-1211 Genève 20, Switzerland.

IUTOX Broadsheet

The International Union of Toxicology (IUTOX) has published a broadsheet which expresses the IUTOX policy for scientific activity agreed at the Annual General Meeting of the Union in Tokyo, Japan, July 1986.

For further information contact: P. L. Chambers, Department of Pharmacology and Therapeutics, University of Dublin, Trinity College, Dublin 2, Ireland.

ICSU Year Book 1987

This is the year book of the International Council of Scientific Unions. It includes names and addresses and other important information on ICSU's 20 international Scientific Unions (of which IUPAC is one), 74 National Members, Associates and Observers, 24 Scientific Associates, and Scientific Committees and Commissions. It also contains a list of abbreviations (e.g. BOSEX = Baltic Open Sea Experiment; COPUOS = Committee on the Peaceful Uses of Outer Space; and COWAR = Committee on Water Research), details of ICSU's publications and a calendar of meetings up to 1993.

The book is edited by F. W. G. Baker and D. Castel and published by the ICSU Press for ICSU from the ICSU Secretariat, 51 Bd de Montmorency, 75016 Paris, France.

Pesticide residues in food — 1986

Pesticide residues in food — 1986 is FAO Plant Production and Protection Paper 77. It is the report of the Joint Meeting of the FAO (Food and Agriculture Organization of the United Nations) Panel of Experts on Pesticide Residues in Food and the Environment and a WHO (World Health Organization) Expert Group on Pesticide Residues, Rome, Italy, 29 September–8 October 1986.

The report includes sections on: mechanisms of action of pesticides; revised Codex classification of foods and animal feedstuffs, carcinogenicity studies for organophosphorus pesticides and a whole chapter on "Evaluations of data for acceptable daily intake for man and maximum residue limits".

FAO Technical Papers can be purchased locally through authorized FAO Sales Agents or directly from Distribution and Sales Section, FAO, Via delle Terme di Caracalla, 00100 Rome, Italy.

Analysis of pesticide residues

The Secretariat of the Joint FAO/WHO Standards Programme have issued Part 8 of the "Guide to Codex Recommendations Concerning Pesticide Residues". These recommendations by the Codex Alimentarious Commission are entitled "Recommendations for Methods of Analysis of Pesticide Residues" (Third Edition). This edition (CAC/PR 8-1986) replaces document CAC/PR 8-1985 and updates an IUPAC Report on Pesticides published in *PAC*: "Recommended approaches to the production and evaluation of data on pesticide residues in food" (*PAC*, Vol. 54, No. 7, pp. 1361–1450, 1982). FAO is the Food and Agriculture Organization of the United Nations and WHO is the World Health Organization.

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Platinum anti-tumor drugs

In a paper entitled "The mechanism of action of platnium anti-tumor drugs" presented at the 24th International Conference on Coordination Chemistry which took place in Athens, Greece, 24–29 August, 1986, Prof. Jan Reedijk discussed the mechanism of action of platinum amine compounds, used as anti-tumor drugs. He discussed the relationship between biological activity and structure of the compounds paying special attention to the nature of the ligands coordinated to platinum. The primary biological target appears to be the interaction with nucleic acids, and therefore studies of the interaction of platinum amine com-

Prof. Jan Reedijk.

pounds (both active and inactive ones) with nucleic acids and nucleic acid fragments are of great interest.

Studies on mononucleotides have made clear that a strong preference exists for platinum binding at guanine-N7 sites. Investigations on oligonucleotides have shown that, when two neighbouring guanines are present, chelation of the *cis*-$Pt(NH_3)_2$ unit (abbreviated cisplatin) is strongly preferred above all other possibilities. Studies on DNA (*in vivo* and *in vitro*) have made clear that similar binding modes occur in DNA and oligonucleotides, and that — after cisplatin binding — the DNA structure is distorted in the same way as double-stranded oligonucleotides.

Reedijk's lecture and other plenary lectures presented at the Athens conference were published in the February issue of *PAC*, Vol. 59, No. 2 (1987).

Pigment of life

Vitamin B_{12} is a "pigment of life". It is involved in enzyme systems known to promote biochemical transformations of no precedent in organic chemistry. Up to now, only a few applications of the use of a vitamin B_{12} as a catalyst of *in vitro* organic reactions have been reported. Nevertheless, Scheffold and co-workers at the University of Berne in Switzerland believe, that cobalmins and their derivatives will be of potential interest to synthetic chemists for the following reasons:

- vitamin B_{12} is a natural, nontoxic, chiral and enantiomerically pure catalyst
- vitamin B_{12} and related metal complexes are powerful mediators in electron-transfer reactions
- according to Eschenmoser's most fascinating hypothesis on the prebiotic origin of porphine-type coenzymes the cobalt corrins belong to the group of "first hour catalysts" taking part in the development of organic chemistry on Earth
- the accumulation of knowledge in B_{12}-chemistry may contribute to a deeper understanding of the (partially still unclear) mechanisms of coenzyme B_{12}-dependent biochemical transformations
- the three acetamide and four propionamide side chains of B_{12} offer a large potential for chemical modifications without touching the central cobalt corrin system (orientation of the side chains; axial-β: a and c, axial-α: b, d and e, equatorial: g and f)
- last but not least: vitamin B_{12} is produced by industrial fermentation and is commercially available (world market 1980 ca. 12 000 kg $year^{-1}$; bulk selling price ca. 3–20 US-$ per gram hydroxocobalamin hydrochloride *1a* or cyanocobalamin *1b*). Despite the relatively high costs, vitamin B_{12} and its derivatives might be applied as catalysts in organic synthesis, if the catalytic turnover is sufficiently high and if fine-chemicals are produced in selective reactions at clean conditions.

These views were put forward in a plenary lecture entitled "vitamin B_{12}-mediated electrochemical reactions in the synthesis of natural products". The lecture was presented at the 15th International Symposium on the Chemistry of Natural Products held in The Hague, The Netherlands, 17–22 August, 1986.

Other plenary lectures included "Enzymic lipoxygenation of arachidonic acid: mechanism, inhibition, and role in eicosanoid biosynthesis" by Corey (USA); "Use of rationally designed inhibitors to study sterol and triterpenoid bio-synthesis" by Taton and co-workers (France); "Progress in natural product chemistry by the chiron and related approaches — synthesis of avermectin B_{1a}" by Hanessian and co-workers (Canada); "Structure, design, and synthesis of immunoactive peptides" by Ivanov and co-workers (USSR) and "Synthesis of natural products and using chiral glycol precursors" by Takano (Japan).

The plenary and section lectures presented at the symposium were published in the March issue of *PAC*, Vol. 59, No. 3 (1987).

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

Nomenclature of prenols (Recommendations 1986)

The prenols are a group of alcohols containing one or more isoprene units, and are, with their esters, the biological precursors of the isoprenoids, a variety of compounds including terpenes and steroids that contain much of the carbon skeleton intact. The new recommendations do not replace any existing document, but set out to systematize existing practice, and to supplement it by paying full attention to the important stereochemistry of the prenols. The general terms are discussed and recommendations for indicating stereochemistry are made. Short-chain prenols that have established trivial names are listed, and the relationship

of the prenols to the simplest juvenile hormones is indicated.

This report was prepared by the Joint Commission on Biochemical Nomenclature and was published in PAC, *Vol. 59, No. 5, pp. 683–689 (1987).*

Recommended approach to the appraisal of risks to consumers from pesticide residues in crops and food commodities

In order to assess potential health problems from pesticide residues in food the extent to which dietary intakes approach or exceed an estimated no-toxicological-effect level should be determined. Retrospective intake data may be obtained from dietary studies.

The "best estimate" of prospective intake may be made from a knowledge of the use of a pesticide, its residues on a crop at harvest and the subsequent fate of those residues, including the effects of cooking and processing. A stepwise approach which contrasts the "best estimate" of consumer dietary intake with an estimate of theoretical maximum dietary intake is recommended to Government agencies and to the pesticide industry.

This report was prepared by the Commission on Pesticide Chemistry (VI.5) and was published in PAC, *Vol. 59, No. 4, pp. 611–624 (1987).*

Purification of solvents for electroanalysis: benzonitrile; dichloromethane; 1,1-dichloroethane and 1,2-dichloroethane

The relevant physicochemical properties of benzonitrile are tabulated and its most important solvent properties are discussed. Examples of typical electrochemical studies in benzonitrile are presented. The impurities present in commercial benzonitrile are listed and a recommended purification method is described.

Values are tabulated for the relevant physicochemical properties of dichloromethane and the most important properties of this solvent are discussed. Examples of typical electrochemical studies in dichloromethane are presented. The impurities present in commercial dichloromethane are listed and a recommended purification method is described.

Values are also tabulated for the relevant physicochemical properties of 1,1-dichloroethane and 1,2-dichloroethane and the most important solvent properties of these two solvents are discussed. Examples of typical electrochemical studies in these two solvents are presented. Common impurities present in commercial 1,1-dichloroethane and 1,2-dichloroethane are listed and recommended purification procedures are described.

This report was prepared by the Commission on Electroanalytical Chemistry (V.5) and was published in PAC, *Vol. 59, No. 5, pp. 703–714 (1987).*

Specifications for infra-red reference spectra of molecules in the vapor phase (Recommendations 1987)

The document supplies specifications for the measurement, collection, presentation and storage of high quality infra-red reference spectra of materials in the vapour phase. The specifications include details of instrument conditions to be used, sampling procedures, hard copy presentation of data, classification of data to facilitate later spectral searching, and recommendations for digital storage. A summary of the parameters for storing spectra on magnetic tape is also presented.

This report was prepared by the Commission on Molecular Structure and Spectroscopy (I.5) and was published in PAC, *Vol. 59, No. 5, pp. 673–681 (1987).*

Use of abbreviations for names of polymeric substances (Recommendations 1986)

The IUPAC Commission on Macromolecular Nomenclature believes that the time is opportune for a new statement regarding the use of abbreviations for the names of polymers and polymeric materials. Previous recommendations by this Commission were published in 1974 and have been incorporated into an expanded draft international standard by the International Organization for Standardization (ISO).

The Commission wishes to state that it has no intention, at present, of devising a new system of abbreviations, owing to the inherent difficulty of assigning systematic and unique abbreviations to polymeric structures. The Commission reminds the reader of the IUPAC policy on the use of abbreviations in the chemical literature which declares, in part, that:

> There are great advantages in defining all abbreviations, . . . in a single conspicuous place in each paper. This is preferably done near the beginning of the paper in a single list.

Indeed, we urge that each abbreviation be fully defined the first time it appears in the text and that no abbreviation be used in titles of publications.

Those wishing to use abbreviations not contained in the 1974 document may refer to the current ISO list. Both of these lists are reproduced in the appendices printed in *PAC*, for the convenience of the reader. It is to be noted that the ISO list in Appendix B uses nomenclature that is not necessarily in accord with IUPAC recommendations.

This report was prepared by the Commission on Macromolecular Nomenclature (IV.1) and was published in PAC, *Vol. 59, No. 5, pp. 691–693 (1987).*

Polarographic determination of absorbable molecules

Various electroanalytical methods that can be used to determine surface active substances in various types of water (natural, drinking and waste water) are discussed.

This report was prepared by the Commission on Electroanalytical Chemistry and was published in PAC, *Vol. 59, No. 5, pp. 715–722 (1987).*

Determination of fluoride in various matrices

Methods for the determination of fluorine in a variety of matrices are reviewed with particular attention to those techniques which are widely adopted as routine methods. The fluoride ion-sensitive electrode is a very successful potentiometric technique for the determination of fluoride in aqueous solution and it has largely replaced the various colorimetric methods formerly used. However, it is apparent that the rapid development of ion chromatography with its advantage of simultaneous multianion determination is introducing a new phase into fluoride analysis.

This report was prepared by the Commission on Microchemical Techniques and Trace Analysis (V.2) and was published in PAC, *Vol. 59, No. 5, pp. 695–702 (1987).*

Recommended methods for characterization of agricultural residues and feed products derived through bioconversion

The present set of guidelines have been put forth with the objective of providing a frame of reference which could be used to evaluate microbial biomass products grown on agro-industrial raw materials. They should be taken in a new perspective and should complement the previous guidelines prepared for SCP grown on synthetic raw materials. The guidelines make reference to important agro-industrial raw materials like animal waste, lignocellulosic crop residues and their mixtures. Bioconversion processes include submerged and solid substrate microbial growth.

This report was prepared by the Commission on Biotechnology (VI.2) and was published in PAC, *Vol. 59, No. 5, pp. 723–730 (1987).*

From Absolute Activity to Z Value

For some years before he died in September 1985, Prof. Victor Gold had been planning the compilation of a compendium of chemical terminology based on published IUPAC recommendations. The Glossary of Terms Used in Physical Organic Chemistry, prepared by Prof. Gold as a project of the IUPAC Commission on Nomenclature of Physical Organic Chemistry and published in 1979 (revised 1983), provided a nucleus for this work, which was eventually carried out under the auspices of the IUPAC Interdivisional Committee on Nomenclature and Symbols (IDCNS).

The credit for initiating this project lies entirely with the late Victor Gold, a Member of the IUPAC Interdivisional Committee on Nomenclature and Symbols. Owing to the availability of only limited resources, the original conception involved three stages, to be carried out under the auspices of IDCNS:

1. identification of IUPAC documents containing suitable definitions (*CI*, Vol. 6, No. 6, p. 42, 1984);
2. construction of an alphabetical listing of the terms defined with references;
3. compilation of the present Compendium, involving editing and harmonization of material from different sources.

Gold was able to complete only the first two stages and to begin the third before his untimely death on 29 September 1985. The project was then completed by Drs Kurt Loening and Alan McNaught, with the support of the Royal Society of Chemistry. The compilation of entries was carried out by Pamil Sehmi, first at King's College London and then at the premises of the Royal Society of Chemistry.

Kurt Loening (Chemical Abstracts Service, Columbus, Ohio, USA).

The late Victor Gold (King's College, London, UK).

Alan D. McNaught (Journals Department, The Royal Society of Chemistry, London, UK).

Pamil Sehmi (Journals Department, The Royal Society of Chemistry, London, UK).

Compendium compilers

The resulting Compendium contains material published up to the end of 1985 from the Physical, Inorganic, Organic, Macromolecular and Analytical Chemistry Divisions of IUPAC. Inevitably at this stage it is by no means a comprehensive dictionary of chemical terms, since some important areas of chemistry have not yet been the subject of published IUPAC recommendations. Furthermore, for practical reasons, no material has been included from the Applied and Clinical Chemistry Divisions of IUPAC, nor from official documents with chemical content arising from other international organizations. Hopefully, these omissions will be remedied in future editions of the compendium. Thus the present book represents only a first step towards a comprehensive and truly authoritative chemical dictionary.

Editorial changes to the originally published definitions have been minimal. Harmonization was carried out as follows:

1. When the definitions of the same term from two different sources are identical, the text is given once, with both references, separated by a semi-colon.
2. When one definition includes all aspects of the other, only the former is given, again with both references, separated by a semi-colon.
3. When one definition largely supersedes another, only the former is given; however, the reference for the latter is cited in the form "see also".
4. When one definition is adequate in all respects but the other contains further information which might be of interest, only the former is given, but the latter is cited in the "see also" form.
5. When the term has different meanings according to the area of chemistry in which it is being used, two entries are given, with specification of the area of application in each case.
6. When the term has more than one definition even within the same area, both definitions are given under the same heading.

Occasionally some minor rewording has been needed to ensure consistency of format throughout the Compendium. Also, it has been necessary frequently to specify the area of chemistry to which a particular definition refers. Extensive cross-referencing has been included, and italicized terms within individual definitions refer to other entries where relevant information is available.

A list of literature references mentioned in the definitions appears after the alphabetical entries. This is followed by a list of source documents, consisting of the major compilations of IUPAC recommendations in book form, and recommendations published in *PAC*.

Compendium of Chemical Terminology: IUPAC Recommendations

This Compendium is an alphabetical listing of terms used in chemistry, with the definitions recommended by various IUPAC Commissions dealing with nomenclature and terminology. Terms from physical, inorganic, organic, macromolecular, and analytical chemistry published up to the end of 1985 are included. The book differs from other chemical dictionaries in that the definitions are truly authoritative, being recommendations agreed by committees of experts after consultation with the chemical community; it is intended to be ongoing as some important areas of chemistry have not yet been the subject of IUPAC recommendations and thus is the first step towards a comprehensive and authoritative chemical dictionary.

The following are the first and last entries in the Compendium:

ABSOLUTE ACTIVITY

The absolute activity λ_B of a substance B in a mixture of substances B, C, . . . is a number defined by

$\lambda_B = \exp(\mu_B/RT)$ or $\mu_B = RT\ln\lambda_B$

where μ_B is the *chemical potential* of substance B, and R is the gas constant.

See also *relative activity*.

G.B. 37

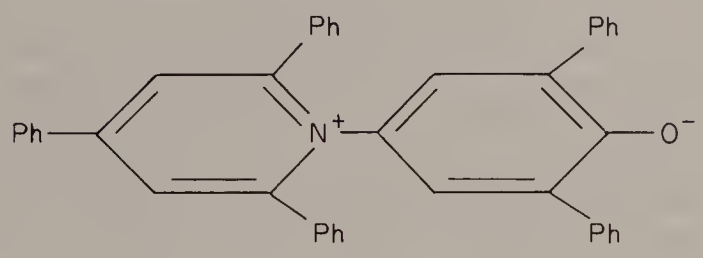
Z VALUE

An index of the *ionizing power* of a solvent based on the frequency of the longest wavelength electronic absorption maximum of 1-ethyl-4-methoxycarbonylpyridinium iodide in the solvent. The Z value is given by

$Z = (2.859 \times 10^4/\lambda \text{ nm}^{-1})\text{kcal mol}^{-1}$

where λ is expressed in nanometres.

A similar scale is the E_T scale (called $E_T(30)$ by its originators) derived in an exactly analogous way from the visible spectrum of



E_T is given by

$E_T = (1.1962 \times 10^5/\lambda \text{ nm}^{-1})\text{kJ mol}^{-1}$

KOSOWER (1958)

DIMROTH, REICHARDT, SIEPMANN and BOHLMANN (1963).

1983, *55*, 1368

Compendium of Chemical Terminology: IUPAC Recommendations, compiled by (The Late) Victor Gold, Kurt L. Loening, Alan D. McNaught and Pamil Sehmi is published by Blackwell Scientific Publications, Oxford, UK, 1987. viii + 464 pp. ISBN 0-632-01765-1; 0-632-01767-8 Pbk/soft. Price: £39.50 (hardback); £24.50 (limp).

The Red Book

The Commission on Nomenclature of Inorganic Chemistry (CNIC) has approved the contents of the several chapters of the Red Book (*Nomenclature of inorganic chemistry: Revision of 2nd Edition, 1970*). The documents are now subject to international public review as required by the IUPAC publications procedure (see Appendix III, *IUPAC Handbook 1985–87*). Synopses of chapters have already appeared in the Provisional Recommendations sections of *CI*. Summaries of the 11 chapters in Part I are presented here so that interested readers can consider their contents and see the relationship between the chapters.

CNIC also intends to publish a Part II, made of chapters dealing with more advanced and detailed recommendations covering more specialized fields such as isotopically modified compounds, inorganic and coordination polymers, nitrogen hydrides, heteropolyanions, organometallic compounds and inorganic rings and chains.

Chapter I-1, General Aims

The opening chapter begins with a brief history of the nomenclature of inorganic chemistry, from its birth to the present day. The general aims and functions of nomenclature are then described and

Copies of chapters

Copies of chapters are available from your nearest national/regional centre. These are listed in *CI*, Vol. 9, No. 1, p. 27, 1987 with additions in *CI*, Vol. 9, No. 3, p. 85, 1987 and on pp. 181–2 of this issue.

the terms "trivial," "semi-systematic" and "systematic" are explained. It is then shown how and why it became necessary to establish rules. This is followed by an explanation of the methodology of name construction.

Various systems of inorganic nomenclature are presented, with examples. The discussion covers binary, additive, and replacement nomenclature, and also systems used in organic chemistry and pertinent systems, such as substitutive, subtractive, and index nomenclature.

The final section contains information about international collaboration on nomenclature matters, on the formation of working groups on nomenclature, and on the role which IUPAC has assumed in this endeavour. This information is not generally known to the chemical commuity. A survey of the accomplishments of IUPAC commissions since 1921 is presented, together with bibliographical reference to all of the inorganic nomenclature documents published by this Commission.

Chapter I-2, Grammar

The purpose of this chapter is to guide the users of nomenclature in building the name or formula of an inorganic compound and to help them verify that the derived name or formula fully obeys the accepted principles. Chemical nomenclature is a very special language with its own vocabulary, syntax and grammar. This chapter contains a general survey of the "grammatical" rules governing the correct use of the various devices used in the construction of a name or a formula. Sections 1 to 14 deal with idiomatic symbols (brackets, dots, commas, hyphens, dashes, etc.), Greek letters and numerals and provide many examples. The various priorities are then discussed in section 15. The last part, section 16, deals with suffixes commonly used in inorganic nomenclature. This chapter is an innovation in the presentation of the Nomenclature of Inorganic Chemistry.

Chapter I-3, Elements, Atoms, and Groups of Atoms

This chapter defines the basic material for inorganic nomenclature, the atomic symbols and names. It also contains definitions of fundamental concepts such as element, atomic charge, and nuclide. The basic methods for indicating ionic charge, atomic number, and mass number are described, as well as a system for naming allotropes of the elements which should be of general if not universal utility.

The final section deals with the indication of groups in the periodic table. For the 18 column periodic table, it is recommended that the old A/B system for sub-groups be abandoned because of its inconsistent application in different parts of the world, and that a system with group numbers 1–18 (the last being the inert gases) be adopted generally. Some approved names for particular groups of elements, such as halogens and transition elements are listed.

Chapter I-4, Formulae

This chapter is intended to serve as a guide to the users of nomenclature of inorganic chemistry in writing formulae correctly according to the rules recommended by IUPAC. The chapter contains the definitions of types of formulae, and shows how to indicate proportions, oxidation states, and ionic charges of constituents, and how to use structural modifiers.

The sequence of citation in formulae is based on the alphabetical order of the symbols of the electropositive and electronegative constituents, respectively. A guide to writing the formulae of isotopically modified compounds is included with cross reference to the detailed IUPAC recommendations. Numerous examples are given to illustrate the rules. Finally, a table summarizes the method for assignment of the formulae of compounds.

The rules of formulae construction are in full agreement with the previously published rules of *Nomenclature of Inorganic Chemistry, 1970* (1970 Red Book), but chapter I-4 gathers together all of the basic information on formulae which was discussed in different chapters of the old Red Book. In addition, some rules, such as that concerning alphabetical ordering, are extended and others explicitly expressed so that it is not necessary to infer them from the examples. This latter method of presentation was used in the 1970 Red Book and has been widely criticized. The number of and types of examples have now been increased.

Chapter I-5, Names Based on Stoichiometry

This chapter serves as a guide in writing stoichiometric names correctly, including the derivation of names, their assembly into the correct sequence and the indication of proportions. Rules for the names of monoatomic, polyatomic and heteropolyatomic electropositive and electronegative constituents, as well as of addition compounds, are included.

The order of citation in names is based on the alphabetical order of the names of the electropositive and electronegative constituents, respectively. The proportions of the constituents can be indicated either by multiplicative prefixes (numerical prefixes and multiplicative numerals) or by indications of the oxidation numbers or the charges on the ions.

There are no changes in substance between this chapter and the 1970 Red Book; however, the discussion is more extensive and many points are explained more precisely. The chapter contains numerous examples.

Chapter I-6, Solids

Chapter I-6 of the new Red Book, Part I, deals with the names of solid phases, chemical composition, point defect notation, phase nomenclature, non-stoichiometric phases, polymorphism, amorphous systems and glasses. The chapter is essentially a new one, differing in principle and detail from corresponding material in the 1970 Red Book.

The point defect notation is based on the Kroger–Vink system. It allows the indication of site occupation by using the element symbols as subscripts. Vacant positions are indicated with V and interstitials with the subscript i. Charges are expressed by superscripts; both real and effective charges can be indicated.

Phase nomenclature is derived from the Pearson notation. In the section on non-stoichiometric phases, descriptions are given of modulated structures, crystallographic shear structures, chemical twinning, infinitely adaptive structures and intercalates.

For the distinction between polymorphs, indication of the crystal system in combination with the name or formula is recommended. Some abbreviations are used to designate amorphous systems and glasses.

Chapter I-7, Neutral Molecular Compounds

This chapter describes the essential characteristics of the nomenclature of relatively simple neutral compounds, providing guidance for name-construction (a) for molecules regarded as substitution derivatives of parent hydrides and (b) for coordination entities.

The principles of substitutive nomenclature are explained and the nomenclature of a chosen set of parent hydrides is described. These principles are extended to cover the nomenclature of oligonuclear hydrides, to various categories of chains of atoms, including branched, and to simple cyclic systems. The case of varying bonding numbers for the central atom, including unsaturation, is treated.

The principles of coordination nomenclature are described and extended from mononuclear coordination entities to dinuclear compounds, and to simple oligonuclear entities. Illustrative examples are provided throughout.

Chapter I-8, Names for Ions, Radicals, and Salts

Cations, anions, radicals and salts are defined and two kinds of radicals are distinguished: those consisting of an atom (or groups of atoms) having one or more unpaired electrons and those consisting of a group of atoms for which the name is used as a prefix in substitutive nomenclature. Charged radicals are treated.

CNIC Newsletter 1987

This item on the Red Book is taken from *CNIC Newsletter 1987*. The newsletter is the second biennial report of the Commission. A version of the first newsletter was published in *CI*, Vol. 8, No. 2, pp. 10–11 (1986).

In addition to the item on the Red Book the 1987 newsletter also contains items under the following headings:

- Recently published documents
- Nomenclature of Polyanions
- Ongoing Activities
- Other Documents of Relevance to Inorganic Chemistry
- Periodic Table (This item was published in *CI*, Vol. 9 No. 2, pp. 49–50, 1987)

The following is an excerpt from the newsletter:

> "CNIC is a unit of an international public service organization, IUPAC, and we are volunteer chemists from around the world. Since nomenclature is our responsibility, we invite your enquiries and suggestions. We can serve you best if we know your needs and opinions. At worst, we should know someone who can name your cluster — or your ligand! Of course, some people already bring us their questions."

Readers are invited to write to the CNIC Chairman about problems involving the nomenclature of inorganic chemistry: Professor Daryle H. Busch, Department of Chemistry, the Ohio State University, 120 West 18th Avenue, Columbus, Ohio 43210, USA, or to any member of CNIC.

The sections on cations and anions deal with species obtained from organic and inorganic molecules after loss or addition of electrons, or hydrogen ions, or of hydride ions. Coordination nomenclature is used when a central atom of metal character is present, whereas substitutive nomenclature is used in other cases. Certain special names are retained (e.g. nitrosyl for NO^+ and kalide for K^-.

Formulae and names of salts are easily constructed by combination of the names of cations and anions. In double salts the cation and anion names are ordered alphabetically unless other requirements mandate an alternative arrangement. Thus, to emphasize structural similarities $AlLaO_3$ is often represented as $LaAlO_3$ (*perovskite*-type).

Chapter I-9, Inorganic Oxoacids

This chapter provides a treatment of the nomenclature of oxoacids which is intended to be comprehensive and useful. The long history of the subject and the importance and widespread use of oxoacid

nomenclatures in teaching and industry warrant this extensive coverage. The approach followed involves systematization, whenever possible, based on the principles of coordination nomenclature.

The introductory sections deals with historical considerations. A definition of an oxoacid is given. Then the principles of hydrogen nomenclature and their extension to all oxoacids and their functional derivatives (halogenides, anhydrides, esters, amides) are given, with many examples. This represents a considerable expansion of the 1970 Red Book, but this systematic use was recommended, at that time, only for acids containing ligands other than oxygen and sulphur.

Acid nomenclature is then presented; it has the feature that the number of acidic hydrogens is not explicitly stated. Polynuclear acids are dealt with next. Except for special cases, this nomenclature is based exclusively on that of coordination compounds.

Chapter I-10, Coordination Compounds

The nomenclature of coordination compounds constitutes a major system of addition nomenclature that is based on structural relationships associated with the compounds of the metallic elements. Basic concepts and definitions are presented and the discussion proceeds on to formulae and names for the simplest coordination compounds. The nomenclature of mononuclear coordination compounds with monodentate ligands is extensively developed with listings of names and abbreviations for many common ligands. Stereochemical descriptors are then presented that designate the geometric arrangements of ligands. Formulae and names for chelate mononuclear complexes follow with special attention being given to the kappa convention for identifying the ligating atoms of ambidentate and polyfunctional ligands, and to stereochemical descriptors for chelated compounds. Chirality symbols are introduced for various polyhedra structures and the skew line helical reference is presented along with an alternative technique based on the Cahn, Ingold, Prelog (CIP) priority sequence of ligands. A limited treatment is provided for the nomenclature of more intricate species including polynuclear complexes and clusters, with emphasis given to central atom numbering and bonding notation. A summary of the nomenclature for single-strand coordination polymers is given and the final section is a brief introduction to the nomenclature of organometallic complexes.

Chapter I-11, Boron Hydrides and Related Compounds

Just as their structures provided novelty and a challenge to chemistry the nomenclature of the boron hydrides must treat distinctive relationships. The bases of boron-hydride nomenclature are discussed and the polyhedral clusters of boron are presented and classified and the class names are given. Stoichiometric names are presented and the general aspects of structural names are discussed. Numbering schemes, steric descriptors and structural isomers are discussed. The "debor" method is given. The treatment of replacement and substitution in boron clusters is considered, including hydrogen substitution, skeletal subrogation and such species as carbaboranes and metalloboranes.

"We gathered in Newark"

About 100 scientists from 17 countries attended the IUPAC sponsored 2nd International Symposium on Solubility Phenomena in Newark, New Jersey, USA, 12–15 August, 1986. Six plenary lectures, 38 contributed papers and 24 poster presentations made up the three-and-a-half-day meeting.

The main topics covered in the symposium were

- gas solubilities
- polymers and micelles
- liquid–liquid systems
- pharmaceuticals and related topics
- general (including calculation methods, models, solubility predictions, thermodynamic data, phase diagrams

Plenary lectures were presented by T. Yokokawa, Sapporo, Japan: "Gas solubilities in molten salts"; S. Krause, Troy, New York, USA: "Polymer solubilities"; C. L. Young, Melbourne, Australia: "Phase equilibria in fluid mixtures at high pressures"; E. Tomlinson, Horsham, UK: "Thermodynamics of solute–liquid distribution"; J. V. Walther, Evanston, Illinois, USA: "Mineral solubilities in supercritical H_2O solutions"; K. S. Pitzer, Berkeley, California, USA: "Theoretical considerations". All the plenary lectures were published in *PAC*, Vol. 58, No. 12 (1986) (see *CI*, Vol. 9, No. 3, p. 104, 1987). The majority of the contributed papers and poster presentations will be published together in the *Journal of Solution Chemistry*.

Dr Robert Rosenstein (left), Glenview, USA, and Professor Kenneth S. Pitzer, Berkeley, USA, discuss a poster on solubility phenomena.

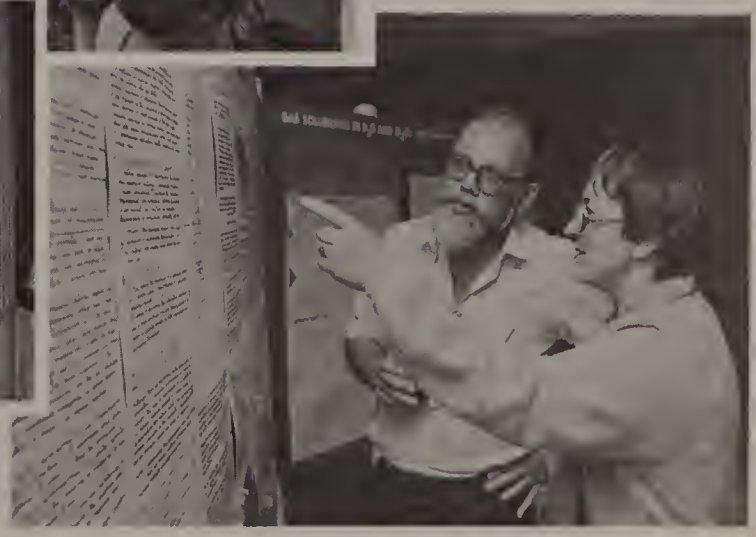
Professor Steven Kertes (left), Hebrew University Jerusalem, Israel, and Chairman of the Commission on Solubility Data offers some advice to Conference Co-Chairman, Dr Mark Saloman, US Army ET&DC, Fort Monmouth, USA. In the centre wearing sun glasses is Professor Eric Tomlinson, Ciba–Geigy Pharmaceuticals, Sussex, UK.

Dr Detehko Pavlov (right), Central Laboratory of Electrochemistry Power Sources, Bulgarian Academy of Sciences, Sofia, discusses gas solubilities with Professor Jack W. Lorimer, University of Western Ontario, London, Canada.

"Hey, look at this!" exclaims Dr Peter Fogg (right), Polytechnic of North London, UK, to Dr Henri Grunbauer (left), Dow Chemical, Terneuzen, Netherlands, and (centre), Dr Ari L. Horvath, ICI, Runcorn, UK.

Conference Co-chairman Professor Reginald P. T. Tomkins (left), New Jersey Institute of Technology compares CO_2 solubilities in beers with Dr G. Bohnsack (centre), Bayer–AG, Leverkuessen, FRG, and (right) Professor Ted P. Dirkse, Calvin College, Grand Rapids, USA.

"We gathered in Newark, Commission Five-Eight which the Secretariat loves to hate". Professor Allan F. M. Barton (Murdoch, Western Australia) at the podium recites a ditty during the conference banquet (see *CI*, Vol. 9, No. 2, p. 70, 1987).



Dr Adam Skrzecz (left), Institute of Physical Chemistry Kasprzaka, Warsaw, Poland and Dr Elzbieta Szczepanlec-Cieciak, Jagiellorian University, Krawkow, Poland, examine a poster.

OCEAN CHEMISTRY: Its central role in the evolution of the Earth

Derek W. Spencer

The ocean and ocean chemistry play a central role in the evolution of the Earth. They contribute to processes affecting its habitability and the distribution of its mineral and living resources. The following document was drafted by Derek Spencer as a proposal for CHEMRAWN IV: Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources. The conference will be held at the Keystone Conference Center, Colorado, USA, 4–9 October. It is designed to bring together leading researchers in marine chemistry and in pure and applied chemistry. The conference aims to stimulate interaction between ocean chemists and pure and applied chemists in order to identify new techniques that may be applied to critical ocean measurements. It also aims to highlight the applications of modern chemical theory to ocean and Earth system problems.

Global change: the setting and need for the conference

In recent years, scientific research has yielded new knowledge of the Earth at an ever increasing rate. Studies of the continents, oceans, atmosphere, biosphere and cryosphere have delineated with greater clarity, the complex interactions among the Earth's components and the profound effects of these interactions, not only upon Earth history and evolution but, also, upon the Earth's environment and resources whose qualities are critical to the welfare of mankind. Our knowledge has provided a deeper insight into the Earth as a system and has set the stage for a complete and unified approach to its study by systematic pursuit of its key components.

"Humans are no longer simple spectators to the drama of Earth evolution but have become active participants on a worldwide scale, contributing to processes of global change that will significantly alter our habitat within a few generations."

Investigations in Earth science, in the past, have been motivated by an innate curiosity about our planet and also by the search for practical benefits to improve the quality of human life. More human beings today enjoy greater abundance from the Earth than at any time in our history. Future advances in weather prediction, agriculture and forestry, navigation and ocean resource management, will provide a still better understanding of Earth processes. But, a third and urgent factor has emerged. Humans are no longer simple spectators to the drama of Earth evolution but have become active participants on a worldwide scale, contributing to processes of global change that will significantly alter our habitat within a few generations.

In some cases, such as the depletion of Earth's energy and mineral resources, the effects of human activity are obvious and irreversible. In other cases, such as the alteration of atmospheric and oceanic chemical composition, the processes of change are much more difficult to document, and their consequences are harder to foresee. Moreover, the global effects of many man-induced changes, at this time, cannot be readily distinguished from the results of natural change on the same time-scale.

Changes on a planetary scale can arise from three causes:

1. External forcing, such as that provided by variations in the Earth's orbit around the Sun.
2. Internal oscillations and instabilities, such as those inherent in the non-linearity of the system or those induced by biological evolution, volcanic eruption or continental rearrangement.
3. Perturbations generated by human activity.

Earth processes can be viewed as a related set of interacting processes operating over time-scales from

The author

Dr Derek W. Spencer is Chairman of the CHEMRAWN IV Organizing Committee. He is currently Senior Scientist and Associate Director for Research at Woods Hole Oceanographic Institution, Massachusetts, USA.

Spencer obtained a BSc in Geology at Manchester University, England in 1954 and a PhD in Geochemistry at the same university in 1957. From 1957 to 1965 he was Geochemist and Supervisor of Geochemical Research, Imperial Oil Ltd, Calgary, Canada. He then moved to Woods Hole as Associate Scientist.

Spencer's research interests include: distribution of chemical species in sea water, mathematical modelling and multivariate statistical techniques for use in geochemical problems and, factors controlling element distributions in sediments. He is the author or co-author of 60 scientific publications in geology and geochemistry.

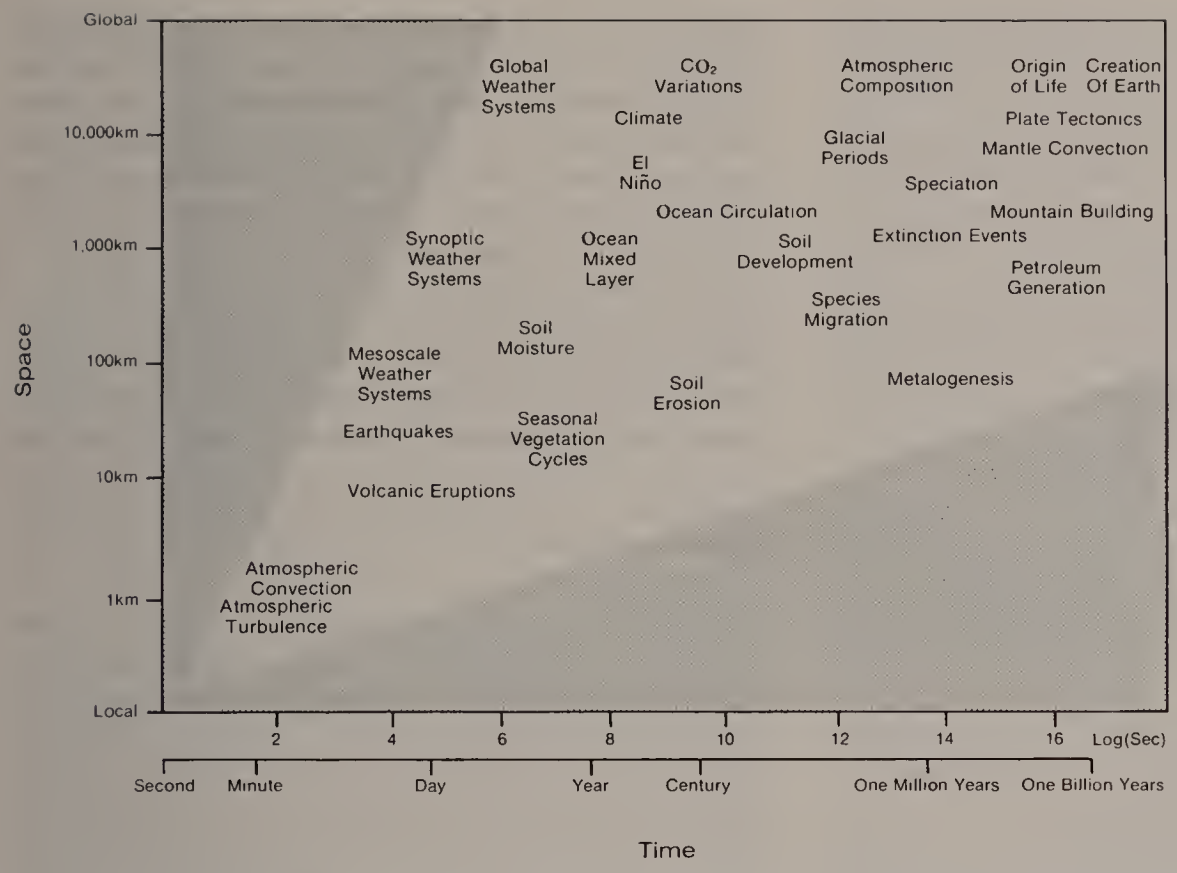


Fig. 1. Earth system processes: characteristic space- and time-scales.

fractions of seconds to billions of years and spatial scales from molecular dimensions to the circumference of the Earth. Fig. 1 illustrates this view. Important interactions connect many of these processes and thus bridge widely separated spatial and temporal regions. Once change is introduced it can propagate through the entire Earth system. Further, the future wise management of Earth resources is dependent upon our understanding of the complex interactions.

The hydrosphere and biosphere are highly sensitive to the external environment, being driven extensively by the energy of solar radiation. Diurnal and annual variations in insolation play a central role. Some of the complexity of the resulting events and motions in the fluid atmosphere and ocean, at least on short time-scales, have been subject to direct observation and are now gradually being understood.

But longer term processes, particularly those involving interactions between several processes, are not understood and research attention must now be directed to these components. Studies of the past 30 years have led to the development of a conceptual model of the fluid and biological Earth, shown schematically in Fig. 2, that describes factors likely to be active in controlling global change on a time-scale of decades to centuries. A notable feature is the presence of human activity as a major inducer of change. Human society must understand these factors and their interactions if it is to adjust and live with the results of change from both anthropogenic and natural factors.

The processes of global change on this time-scale, fall into two basic groups, (1) the climate system and (2) the biogeochemical cycles, woven together with the ubiquitous presence of water in the forms of vapour, liquid and ice.

The ocean and ocean chemistry in the Earth system

Comprehension of many of the future problems and major progress toward the development of an understanding of the Earth as a system, clearly depend on the integrated contributions of many disciplines, but it is

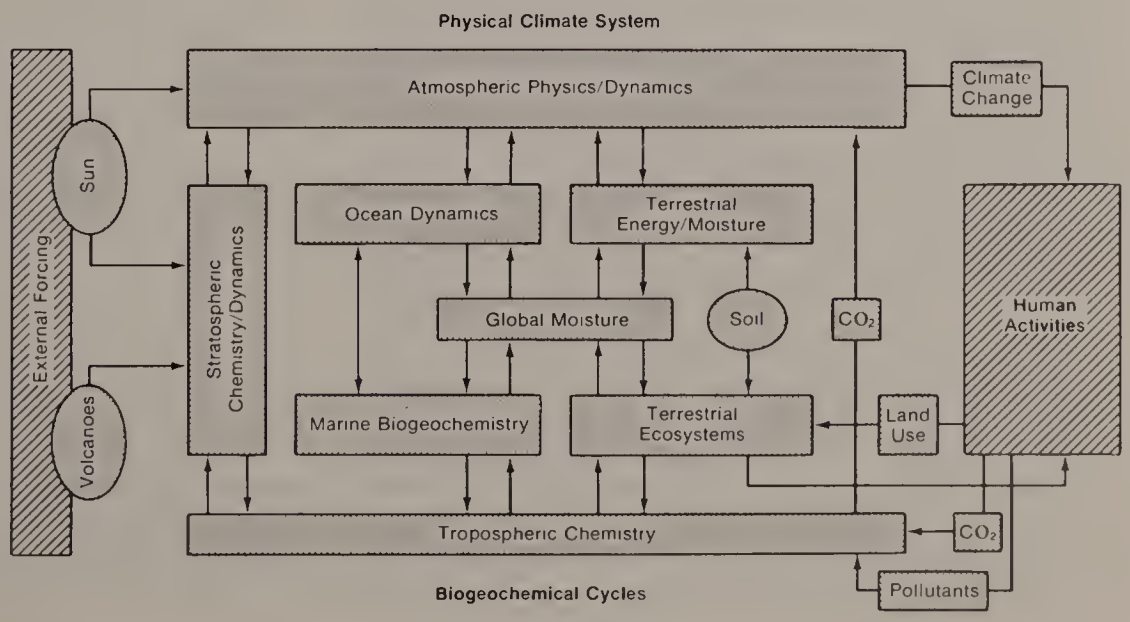


Fig. 2. Factors likely to be active in controlling global change on a time-scale of decades to centuries.

evident from both Figs 1 and 2, that ocean biogeochemistry occupies a central position in both the spatial and temporal frames.

The ocean, with its many reservoirs of energy and materials, may be thought of as "the flywheel" of the Earth system. It is crucial that we develop a much more detailed understanding of the exchanges of energy, momentum and materials among the ocean reservoirs and between the ocean, the atmosphere and the land, for these are the components that are likely to be intimately involved with the internal instabilities that may be most affected by change.

The biogeochemical cycles, movements by key chemical constituents through the Earth system, are essential to the maintenance of life on our planet. Carbon, nitrogen, sulphur and oxygen play primary roles, cycling in various forms through the atmosphere, the hydrosphere and the lithosphere, and interacting with other essential elements.

In addition to the sustenance of life, the biogeochemical cycles play a major role in determining the atmospheric concentrations of radiatively active gases that influence the Earth's energy budget. The most prominent of these, carbon dioxide, is of special interest because of the human role in perturbing the global carbon cycle through the burning of fossil fuels. Also, methane, nitrous oxide and chlorofluoromethanes are entering the atmosphere at accelerating rates and are additional "greenhouse gases".

The biogeochemical cycles impact on longer time-scales by establishing environmental conditions leading to the production of oil and mineral resources. Chemical fluxes and reactions in the ocean form the basis for a major control of the global biogeochemical cycles, particularly over short and intermediate terms (seconds to hundreds of years). Over these time-scales, there is a clear and strong interaction with ocean living resources. The role that the cycling of nutrients in the ocean plays in ocean biological productivity is understood in principle even though our current observational base is too poor to have effective predictive capability and the nature of many non-linear interactions that seem to be involved in the whole-scale regional replacement of dominant food species, are not at all clear (e.g. anchovy/sardines in west-coast fisheries).

However, as illustrated in Fig. 3, the cascade of influence from the short and intermediate time- and spatial-scale ocean processes to the large spatial-scale processes in weather and climate and the longer time-scale Earth mineral resource problems are of even greater significance to the habitability of the planet and the social and economic welfare of mankind.

Much of our current understanding of the Earth as a system has derived from our abilities to measure the chemical and physical properties of the ocean, to understand the observed variability in terms of basic biological, physical and chemical principles and to verify and extrapolate the results in multicomponent, conceptual and numerical models. Moreover, developments in basic measurement technology have supplied many of the tools that have been instrumental in allowing us to observe the ocean with new and fresh perspectives. In particular, basic chemistry has had significant impacts in the past and must play a major role in the future in our abilities to measure and conceptualize Earth processes.

In the development of our understanding of global change some very real and specific challenges lie ahead. How are the important measurements to be made? What new tools will be needed? How firm is our grasp of the fundamental processes?

For ocean chemists the challenge is particularly acute. The spectrum of oceanic processes is typically "red" so that measurements over long time periods are essential for the observation of change. In some cases, superb development of technique has been achieved (e.g. low level radiochemistry and mass spectrometry) so that critical observations can be made. In other

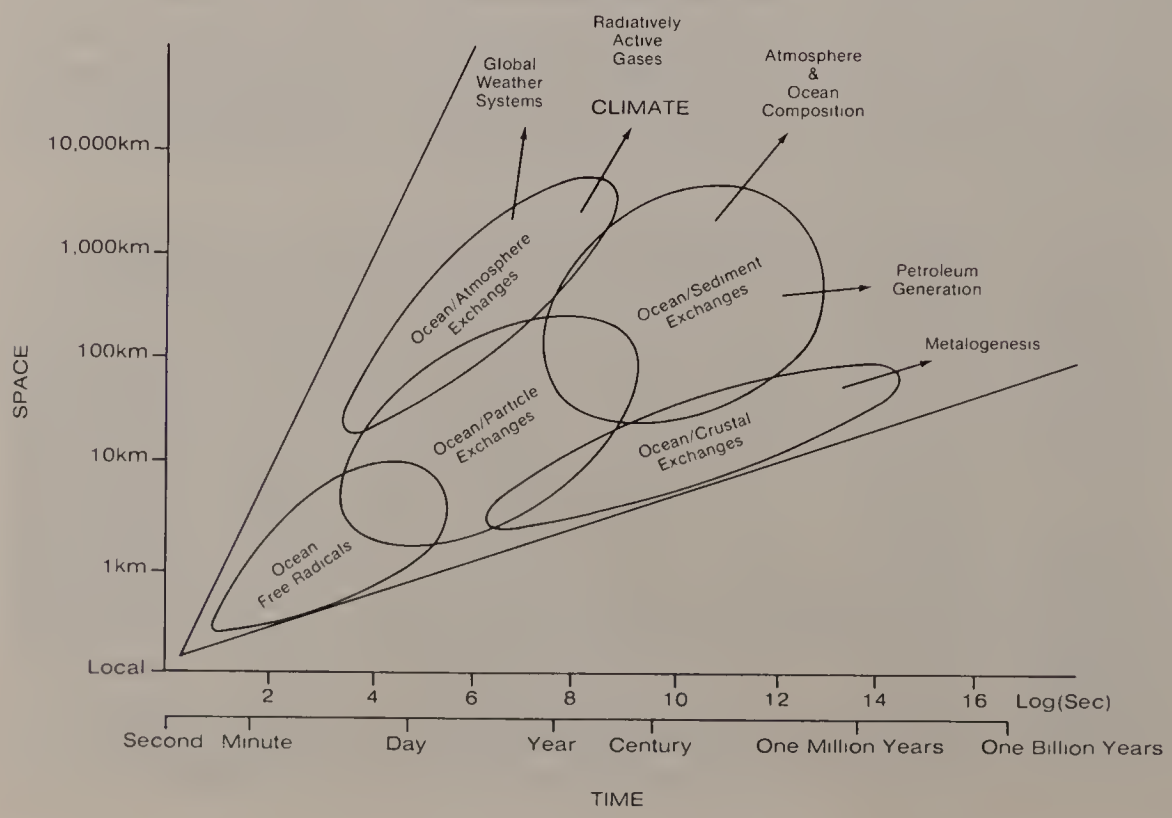


Fig. 3. The cascade of influence from the short and intermediate time- and spatial-scale ocean processes to the large spatial-scale processes in weather and climate and the longer time-scale Earth mineral resource problems are of even greater significance to the habitability of the planet and the social and economic welfare of mankind.

areas, the parent field of chemistry has developed somewhat separately e.g. laser probes, IR spectroscopy, electrochemistry and sensor development) so that a significant gap exists in the development of modern observational systems and chemical theory and their application to ocean problems.

"Many chemists are unaware of the major problems in ocean chemistry and many ocean scientists are frustrated in their quest for new chemical tools."

Many chemists are unaware of the major problems in ocean chemistry and many ocean scientists are frustrated in their quest for new chemical tools. For these reasons it is timely to bring together distinguished ocean scientists and chemists to examine these challenges and to propose approaches for their solution.

CHEMRAWN IV

Recognizing the central role of the ocean and ocean chemistry in the evolution of the Earth, it is the goal of the conference/workshop to stimulate the interaction between ocean chemists and pure and applied chemists with the purpose of identifying new techniques and concepts that may be applied to critical ocean measurements and to highlight the applications of modern chemical theory to ocean and Earth system problems.

The structure of the conference and workshop

Although there are very broad areas of need, strong topical interests of the marine chemical community and some of the most important subject areas requiring further concentrations of effort may be described under the following headings.

- Oceanic free radical chemistries, especially those induced by sunlight
- The nature and reactions of marine particle surfaces
- Air–sea interface chemistries
- Models of sea water including irreversible thermodynamic systems
- Sea–sediment interface chemistries

Chemical processes acting in these domains are major controls on the biogeochemical cycles in the ocean and processes operating within them determine the important fluxes of materials at ocean boundaries. Some of the critical questions that will be considered are outlined below by co-leaders of the five sections.

The CHEMRAWN Conferences

CHEMRAWN stands for 'CHEMical Research Applied to World Needs' and is the title of a series of IUPAC sponsored conferences:

CHEMRAWN I	Future Sources of Organic Raw Materials Toronto, Canada, 1978
CHEMRAWN II	Chemistry and World Food Supplies: The New Frontiers Manila, Philippines, 1982
CHEMRAWN III	Resource Material Conversion — (Bio-)Chemical Process Bridges to meet Future Needs The Hague, Netherlands, 1984
CHEMRAWN IV	Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources Colorado, USA, 1987
CHEMRAWN V	Current and Future Contributions of Chemistry to Health — The New Frontiers Heidelberg, FRG, 1986
CHEMRAWN VI	Advanced Materials for Innovations in Energy, Transportation, and Communications Tokyo, Japan, 1987

Oceanic free radical chemistries

Oceanic free radicals, their formation and reactions are short to intermediate time- and spatial-scale phenomena. Marine chemists seek to understand the distribution and cycling of materials in the oceanic realm of the land–sea–air system, using chemical approaches to study the interplay among chemistry, biology, and ocean physics. For many elements and compounds, they recognize the importance, often dominance, of biological processes in effecting the observed chemical speciations and physical distributions, especially in the upper kilometre.

Photosynthesis is among the clearest-cut biological determinants, converting CO_2 and H_2O to an array of partially reduced biochemicals and oxygen. Because photosynthesis is quintessentially a redox process and many elements are recycled efficiently in the oceans (C, N, P, Si . . .), subsequent transformations on the way back to CO_2 and H_2O (remineralization) also of necessity involve much redox chemistry and biochemistry. Thus, while all chemical reaction mechanisms are of interest, redox processes are unquestionably central to many questions.

In an ideal ecosystem, the material fluxes and the associated energy fluxes, ultimately driven by photosynthesis, might be entirely effected biologically. In the real world, inefficiencies and free energy gradients inevitably arise, particularly redox disequilibria which the biota do not (possibly cannot) exploit, or for which chemical rates are non-negligible with respect to biological rates. How then does chemistry define the

nature of the system where biology cannot? How does it limit biology by dissipating free energy gradients at competitive rates?

For example, in soils, simple biomolecules polymerize to a complex molecular array of ill-defined quasi-random structure, ranging from large colloids to low molecular weight molecules. This material is variously known as "heteropolycondensates", "humic substances" or "Gelbstoffe". Analogous processes occur for solutes in sea water and in marine sediments to which rivers contribute large quantities of the soil-derived materials. These dissolved organic substances, of both marine and terrestrial origin, are refractory on the cycling time-scale for typical biomolecules in the upper ocean (minutes–months), but on the appropriate oceanic time-scales (for example the mean mixing time of the ocean of about 1000 years), they must be reacting, as their age (based on C-14 activity) is a few thousand years, which is young compared to most geological measures (ocean basins, 100 million years circulation of ocean through Earth's crust, 10 million years glacial cycles, 10–100 thousand years etc.) . . .

Thus, one example of the kind of question in marine science whose resolution probably lies in basic chemistry is: where do these refractory (non-biodegradable) molecules go? On the one hand, they are supposedly not metabolizable, on the other hand they do not accumulate in sea water over geologic time. Chemical oxidation and adsorptive removal prior to burial in sediments probably remove these materials which constitute most of the organic carbon in the ocean.

The answer to this question is important in several contexts. Marine scientists are very interested in the factors determining the differentiation between burial in sediments versus retention in water, and of biological availability and recycling of substances. If these coloured materials built up indefinitely in the oceans, the effect on oceanic optical properties would ultimately make the world a very different place. Active photosynthetic organisms have been found as deep as 268 metres, which requires great water transparency. How can coloured materials continually be formed in and injected into the ocean, and sea water still be on average extraordinarily transparent? Perhaps photobleaching is involved, or colour and adsorbability correlate well?

A shipboard laboratory for stripping Radon-222 gas from sea water. Radon-222 is the 3½ day half-life daughter of radium 226 and relative to its parent occurs in excess in the near bottom waters and is deficient in near surface due to fluxes of radon from sediments and to the atmosphere. Measurements of the activity gradients have proved useful in studying near boundary flows in the ocean and in understanding gas exchange processes at the surface ocean.

The example above is intended to typify several main themes that recur in other problem areas where chemical transformation mechanisms require consideration in the marine environment. The competition of the biota, the central importance of redox processes and the long time-scales are not unique to the humic substances problem. In principle, it would be logical to examine all chemical redox dynamics from a kinetic/mechanistic viewpoint. In practice, the subset involving radical chemistry seems both more tractable and best supported by existing evidence. From thermodynamic and kinetic viewpoints, we know that in much of the oceanic system the primary redox disequilibria involve the coexistence of organic and other covalent compounds in the presence of dissolved oxygen and other oxidizing agents. Also, some metals exist in redox disequilibrium with the oxygen/water or related couples. Often, the disequilibria are most intense in the upper ocean, where an enormous flux of sunlight is available and these are conditions where radical processes can induce chemical change. Where evidence is available, it is largely consistent with this viewpoint.

Oceanic radical sources

At this time, most is known about photochemistry as an oceanic free radical source. However, as in the atmosphere, secondary reactions will be of considerable importance, so that the chemistries of key radicals and their products, such as superoxide and peroxide, must be considered independent of any one specific source term. For example, in oceanic surface waters hydrogen peroxide is produced photochemically (concentrations often in the 0.02–0.2 micromolar range), but reacts with a half-life of >1 day, thus perhaps initiating night-time chemistry in addition to being formed by sunlight-induced reactions.

In certain environments, thermal autoxidations are also likely radical sources and pathways. Some examples are the autoxidative degradation of the photosynthetic apparatus and the polyunsaturated fatty acids (PUFA) of senescent or dead biota (marine PUFA tend to have very high degrees of unsaturation), the chemical oxidation of reduced metals, such as Fe(II) and Cu(I) species known to be present in some environments. An O_2/H_2S interface is widespread in some marine systems, occurring at shallow depths (mm–cm) in virtually all sediments near continents, and within the water column where restricted circulation and intense biological production coexist (the Black Sea, numerous fjords, and seasonally in areas off Peru and in the northern Indian Ocean). The O_2–H_2S reaction seems to be partly chemical and partly biologically mediated and the chemical component may in part involve radical chains.

A third, more speculative but potentially important

source of radicals and other highly redox-active species may be cells. There is evidence that some normal cells may excrete superoxide ion-radicals, peroxide, and/or cyt-c-reducing materials of unknown structure. Light-stressed or senescent cells may lose such materials due to impaired membrane integrity, and the surfaces of some cells appear to be able to effect a form of passive photocatalysis (i.e. similar activities for living or dead cells). Recently, it has been shown that nitrite-reducing bacteria excrete roughly 50–75% of the nitrite reduced as nitric oxide, which is rather stable as radicals go but does set a clear precedent for the existence of biogenic radical fluxes. Certainly, marine chemists would be interested in basic biochemical evidence for constraints on radical excretion as well as methods for measuring or constraining such fluxes.

Finally, the molecular-scale to micro-scale air–sea interface is a boundary of special interest to marine chemists, atmospheric chemists, satellite signal processors, and physical oceanographers. Here we have not only the normal marine radical sources, perhaps at enhanced intensities, but also a regime bombarded by the array of radicals arising from atmospheric chemistry. Although some crude numerical estimates concerning the intensity and effects of this process have been made, there is a need for experimental evaluation or much more sophisticated reaction dynamic modelling to understand whether airborne radicals may control air–sea interface chemistry and some gas fluxes. This area poses challenging measurement issues that are also of interest in cloud droplet and fog chemistry, chemical engineering and lung physiology.

Sampling the ocean can be a strenuous and sometimes dangerous business. The "Rosette" samplers in this photograph are non-contaminating PVC bottles that can be closed upon an electric signal command from the surface. The sampler is lowered on a conducting cable which includes sensors for conductivity, temperature and sometimes an oxygen electrode and transmissometer.

Dr Oliver Zafiriou
Woods Hole Oceanographic Institution

The nature and reactions of particle surfaces in seawater

There are a wide variety of types of particles in seawater and their reactions can be studied on different spatial- and time-scales. Spatial-scales range from microscopic studies using surface spectroscopy to ocean basin scale scavenging models. Time-scales range from true adsorption reactions in the microsecond range to ocean scavenging reactions with characteristic times of years. Materials present in or adsorbed on particles may move independently of the water and the redistribution of chemicals in particulate form is the principal cause of element non-conservative behaviour in the ocean.

In most of the open ocean water column, particles have a biological origin. There appear to be two size classes of particles. The very small (0.4–10 μm) suspended matter in seawater is present at concentrations of 10 to 20 μg kg^{-1}. Operationally, this material is defined to be the solid phases retained on 0.4 μm membrane filters. In addition, there are large (>1 mm) particles settling rapidly (50 to >200 m/d) through the ocean. These particles include both fecal pellets and marine snow. These larger particles are produced predominantly by biological processes in the photic zone of ocean.

In general, the large particle flux is composed of about 60% organic carbon, 25% $CaCO_3$, 10% SiO_2 and 5% aluminosilicates (mostly wind-blown and of continental origin). However, the range in composition is large.

These particles remove many trace constituents from seawater. Some elements are removed as essential nutrients by algae growing in the surface ocean. Other elements are adsorbed by the particles as they are formed and settle through the water column. Distinguishing between the biological and inorganic reactions is an unresolved problem. Whether these reactions are predominant in the interior of the ocean, or at the boundaries of the ocean, is also an area of current interest.

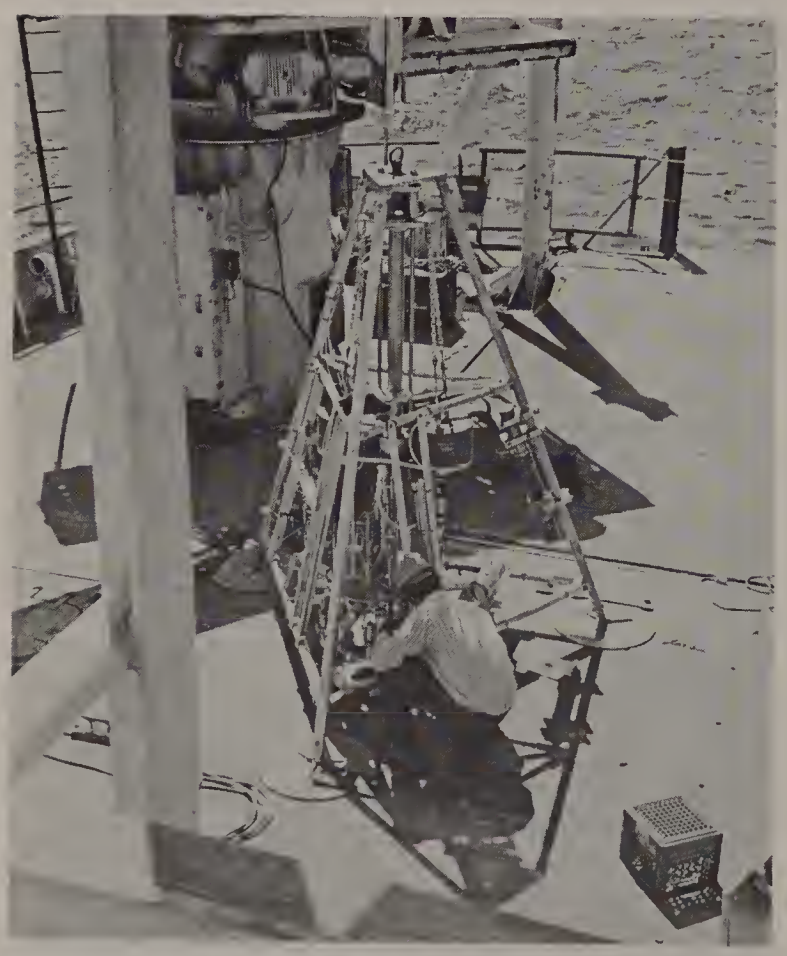
When the large biogenic particles reach the sediments, they decompose, releasing their trace metals back to porewater or seawater. Sediments have a different composition. They are mostly clay minerals, opal (SiO_2), quartz or calcite ($CaCO_3$). Organic matter contributes only about 1%. Iron and manganese oxides play a more significant role, especially locally where manganese nodules are accumulating. Many metals are transported through the water column primarily associated with particulate organic matter and although only

a small fraction of the raining organic matter is preserved, the metals appear to be mostly retained in the sediments. Important phase transitions must be occurring at the sediment–water interface.

At depth in the sediments and in anoxic basins, like the Black Sea, metal sulfide particles play an important role. We know little about the relative surface chemistry of sulfide and oxide surfaces or how different elements in the periodic table will be distributed between these types of solids under anoxic and sulfidic conditions.

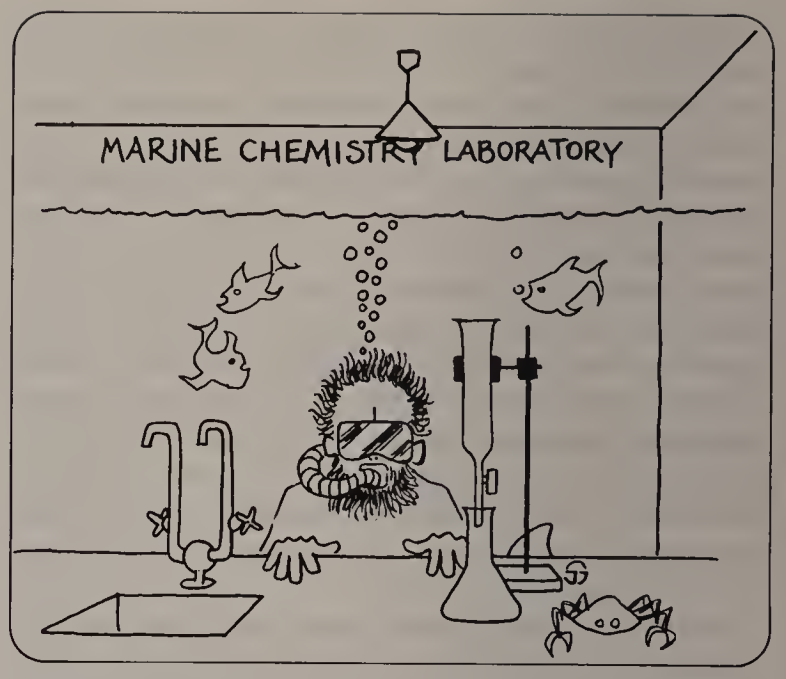
Some of the problems that are currently in need of solution may be illustrated by the following questions:

- What is the relative importance of boundary scavenging versus removal by particles settling through the interior or the ocean? Why are different elements affected differently?
- What is(are) the mechanism(s) of the boundary scavenging?
- Are all particles in seawater covered by organic coatings? If they are covered, what is the extent of coverage? How do these coatings influence trace element uptake?



A bottom lander. Detailed profiles of the sediments in the deep ocean can be obtained from this device. The lander may be lowered, or free falls to the ocean floor at depths of 4–6000 metres. Following emplacement, precision sensors, probes and covers are lowered into the sediment to retrieve samples of the mud, pore water, and several near surface properties. Recovery of the free-fall instrument is by acoustic signal from the surface which releases weights and allows the device to float to the surface.

Samples provided by landers, such as this, have been extremely useful in studying fluxes of materials across the ocean–sediment interface.



- Is the biological removal of trace elements in the upper ocean by active, essential-nutrient-type uptake or is it simply due to adsorption by cell surfaces? If both mechanisms are important, what is the relation between the two? Why do we see such good dissolved metal/nutrient co-variance in large parts of the ocean?
- What is the nature of the particle concentration effect on adsorption rate constants and equilibrium adsorption distributions? Is it due to overlapping double layers or due to colloid coagulation chemistry?
- In which ways are solid surface reactions different in aerobic seawater compared to those in anoxic, sulfide-rich seawater?

Dr James Murray
University of Washington

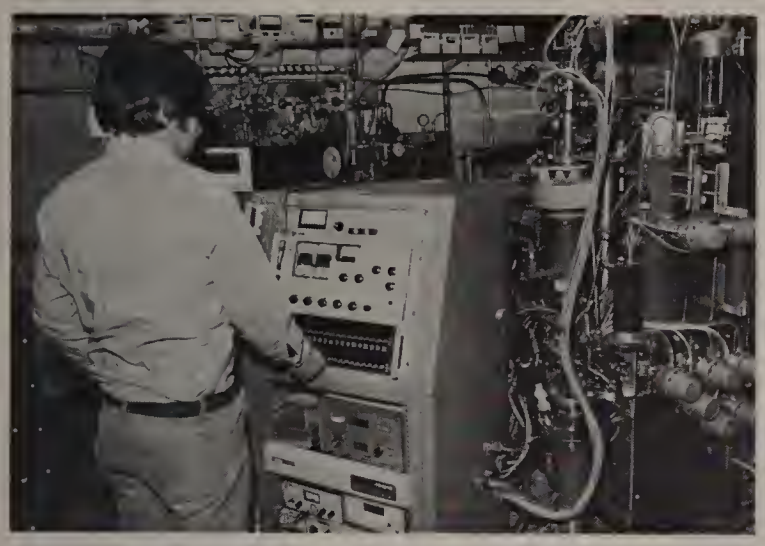
Air–sea interface chemistries

The scientific concerns over a changing atmospheric chemistry are well known. For many purposes, the atmosphere may be thought of as a reaction vessel fed by land and sea fluxes. If we see the ocean only in its superficial role, that of forcing the atmosphere, we would be deficient. The object should be to develop a fundamental chemical understanding of the system in its own right.

Large-scale processes drive isotopic disequilibria, trace metal chemistry, natural products formation, etc. The variety can be bewildering, yet the concentrations and fluxes are set by real limits. It is the task of the ocean chemist to make the observations and uncover the rules by which this system works.

Some of the most pressing requirements for future studies of the air–sea interfaces may be summarized as:

- *Sensors*. Time-dependent oceanic data are hard to come by. Sensors for biogenic gases, or indeed a rich assortment of species are needed. They must have the precision to resolve many of the small natural signals.



A rare gas mass-spectrometer. This instrument was constructed specifically to determine the ratio of ^3He to ^4He in sea water samples. In many ocean areas, considerable excesses of ^3He occur over concentrations in equilibrium with the atmosphere, due to injection from hydrothermal springs in the deep ocean and to the decay of tritium introduced by nuclear bomb tests. Measurement of the ^3He daughter has proven to be the most sensitive method to assay the tritium content of sea water. Measurements over the last several years have provided an excellent picture of the nature of the circulation in some deep ocean areas and in understanding the rates of formation of deep water from surface waters.

- *Electrochemistry*. Modern work on modified electrodes has been only slowly applied to oceanic measurements. There is room for rapid progress in the trace metal field.
- *Optical properties*. UV-visible spectroscopy, the familiar province of the chemist, has been used in seawater by bio-optical scientists. It is the basis of the only space-borne ocean "Chemical" sensor (Coastal Zone Color Scanner, Ocean Color Imager, or MODIS). In spite of severe atmospheric correction problems, there are excellent opportunities for natural products/pigment chemistry from space.
- *IR spectroscopy*. There has been little application of modern FTIR spectroscopy on an expedition basis and it is likely that many improvements can be introduced from modern chemistry. For example, it should be possible to obtain $^1H^2H$ or possibly $^{12}C^{13}C$, ratios by pushing these techniques to their limits.
- *Fluorescence/chemiluminescence*. Such techniques offer great sensitivity and there are many applications. H_2O_2 and CO determinations are now well established. Fluorescence is commonly used for tracer dye detection. It may be possible to consider deliberate release of a reactive/non-reactive tracer pair to monitor real time *in situ* ocean chemical reactivity.

Dr Peter Brewer
Woods Hole Oceanographic Institution

Chemical models of seawater

To understand the chemical processes that occur in natural waters, it is necessary to have a knowledge of ionic interactions.

Short-range ionic interactions between ions and water and ions with other ions and neutral molecules have been shown to affect equilibrium processes such as acid–base, solid–liquid, gas–liquid and oxidation–reduction processes.

The thermodynamic and transport properties of natural waters are also affected by ionic interactions. Since ionic interactions affect the state of metal ions, the biological activity is also affected by ionic interactions. Recent work has also shown that ionic interactions can affect the rates of chemical processes in natural waters.

The composition of natural waters can be quite variable and chemical models have been developed that can be used to determine the physical properties and estimate the form of ions in a solution of known composition. Since the conditions of natural waters can be quite variable in temperature (−10–400°C), pressure (atmospheric to 1100b) and ionic strength (0–17m), this is not a simple task. Although ocean waters have nearly the same relative composition for the major components (greater than 12 ppm by mass) (see Table 1), the composition of trace components can be quite small (see Table 2) and variable.

Table 1. The concentration of the major components of average seawater at 25°C and pH = 8.1.

species	molality	species	molality
Na^+	0.48610	Mg^{2+}	0.05474
Ca^{2+}	0.01066	K^+	0.01058
Sr^{2+}	0.00009	Cl^-	0.56577
SO_4^-	0.02927	HCO_3^-	0.00193
Br^-	0.00087	CO_3^-	0.00020
$B(OH)_4^-$	0.00009	F^-	0.00007
$B(OH)_3$	0.00034		

In recent years great progress has been made in using chemical models to estimate the physical properties of natural waters and the activity coefficients of the major components between 0° to 50°C and 0 to 1100b.

Table 2. The concentration of some metals in seawater/nM.

metal	surface	deep
Cu	2	3.5
Pb	0.07	0.01
Cd	0.13	0.67
Zn	0.15	9.1
Ni	2.6	6.8
Co	0.09	< 0.05
Fe	13.4	9.0
Mn	9.1	—
Cr	1.9	—
Hg	0.04	—

Table 3.

form	example	diameter/nm
particulate	clays retained by 0.45 m filter	459
hydrated ion	$Cu(H_2O)_6^{2+}$	0.8
inorganic complex	$CuCO_3^0$	1
organic complex	Cu-glycinate	1–2
absorbed or inorganic colloids	Pb^{2+}–MnO_2	10–500
absorbed or organic colloids	Cu^{2+}–humic acid	10–500

Progress has also been made in determining the total concentrations of minor elements in ocean waters. Although the measurements of the total concentrations are useful, they provide little or no information about the bio-availability, toxicity or its possible transformations due to absorption, photochemistry, etc. The speciation or individual physical-chemical form of an element is needed to understand the rates and mechanisms of these transformation processes. This speciation of individual elements can be examined by the development of analytical techniques that can be used to measure the various forms and by using chemical models. This is not easy since the physical-chemical forms can be quite variable (see Table 3). The other difficulty is that, in some cases, the form of an element is controlled by kinetics rather than thermodynamic processes. The effect of ionic interactions on rate processes in ocean waters is not very well understood. Although kinetic-thermodynamic models may be useful in estimating the effect of the major components on rate processes, direct measurements are probably needed to confirm these estimates and examine the effect trace organic ligands have on the transformation of trace metals.

It is useful to examine an example to appreciate the problems involved. A number of metals can exist in different oxidation states in seawater (Fe(II)–Fe(III), e.g.). The reduced species can be generated in anoxic waters or sediments, in the gut of an organism or perhaps by photochemical processes. It would be useful to have analytical techniques to measure the various redox forms as well as models that can be used to study the rates of their transformations. In waters without organic ligands the thermodynamic models predict that the dissolved forms of Fe(II) can be

$$Fe^{2+},\ Fe(OH)^+,\ Fe(OH)_2^0,\ FeCl^+ \text{ and } FeSO_4^0$$

while the dissolved form of Fe(III) is largely

$$Fe(OH)_2^+.$$

The rates of oxidation of Fe(II) in seawater indicate that the rate determining step is

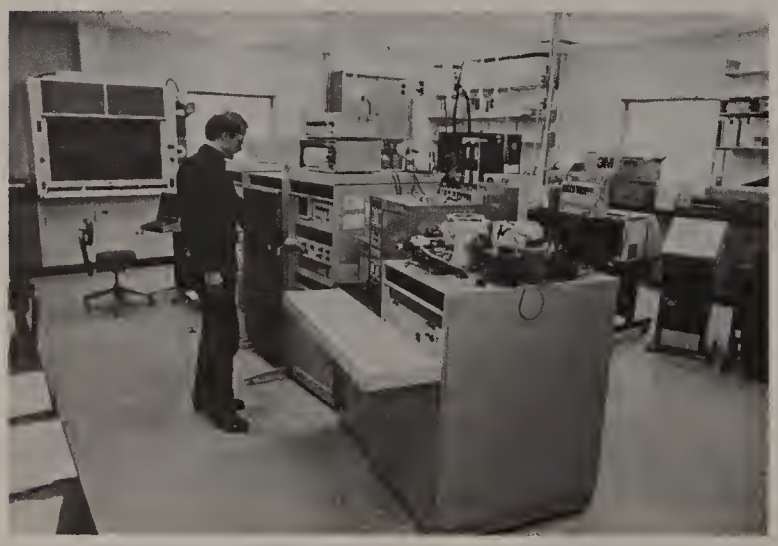
$$Fe(OH)_2^0 + O_2 \rightarrow Fe(OH)_2^+ + O_2^-.$$

The oxidation of $FeCl^+$ and $FeSO_4^0$ appears to be slow. The presence of organic ligands (L) in seawater appears to slow down the oxidation. Is this due to the formation of FeL complexes that have a slower oxidation rate or the quenching of free radicals such as O_2^- which reacts very quickly with Fe^{2+}? For progress to be made in understanding the mechanisms of chemical transformation in ocean waters, a close coupling must be made between analytical speciation studies and the development of chemical speciation models. The schemes presently used by marine chemists to model chemical systems in the oceans need a new look.

Some critical questions concerning the applications of models to seawater composition are:

- The rates of many oxidation–reduction reactions, as well as photochemical reactions, are known in pure water. How can one estimate the effect of ionic interactions on these processes so that rate constants can be determined for seawater?
- What new analytical techniques are available to determine redox species in aqueous solutions at nanomolar levels?

Dr Frank Millero
RSMAS, University of Miami



Modern research in organic aspects of ocean biogeochemistry relies extensively on gas-chromatograph-mass-spectrometry techniques to characterize and quantify ultra-trace levels of organic molecules in sea water and sediment samples. Following the path of various "bio-marker" molecules is revealing much about the processes affecting the production and fate of organic matter in the ocean.

Sediment–sea interface chemistries

The ocean sediment–water boundary is a key transition zone linking shorter time-scale larger spatial-scale ocean processes to longer time-scale shorter space-scale geological processes. Transitions and fluxes within and across this boundary play a major role in determining the chemical composition of seawater, particularly the levels of many important trace constituents.

The composition of sediments accumulated within ocean environments depends upon the nature of and the relative rates of processes operating at the boundary. Our ability to read the record of Earth history contained within sedimentary columns depends upon our knowledge of the boundary processes. The correct understanding of the longer term palaeoclimatic changes contained within sedimentary records plays a key role in our ability to predict future changes.

Surface sediments are both sinks and sources of materials to the ocean water column. Predominantly

they receive particle inputs and release dissolved constituents, many of which may react over varying periods of time with the seawater components to establish dynamic equilibrium that determines the composition of the deep ocean as it currently exists for many constituents.

The manner in which the ocean responds to changes, such as those imposed by many anthropogenic inputs, is ultimately dependent on the chemistry of the sea–sediment interface.

Some topics requiring intensive study are:

- Methods of analyses and techniques for the determination of fine-scale (mm) gradients of dissolved concentrations across the sediment–water interface (e.g. microelectrode techniques?)
- Kinetics of oxidation–reduction reactions (Mn(II)–O_2, Fe(III)–O_2, H_2S–O_2, NH_4^+–O_2, Mn(IV) reduction, NO_3^- reductions, etc.) with emphasis on enzyme and microbial catalysis of these reactions
- Kinetics of oxidation–reduction reactions with emphasis on organic matter degradation using O_2, NO_3^- and SO_4^{2-} electron exceptors, fermentation and methane formation
- The organic chemistry of marine organic matter with emphasis on "biomarkers" that may be preserved in ocean sediments and provide information about past levels of productivity of ocean surface waters
- The concentration of trace metals in seawater and incorporated in calcium carbonate shells with emphasis on very low level analysis (e.g. I.C.P.-mass spectrometry) and mechanisms of incorporation of trace metals in the crystal matrix.
- Mineral formation and dissolution kinetics. Here emphasis should be on the mechanisms involved, solid solution effects, and kinetics of the reactions.

Acknowledgment

Figures 1 and 2 are reproduced from a report: *Earth System Science: A program for Global Change* (1986) by the Earth System Sciences Committee (NASA), Chmn. F. Bretherton.

References

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Dr Steven Emerson
University of Washington

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1987

Plasma Chemistry

31 August–4 September. 8th International Symposium on Plasma Chemistry. Tokyo, Japan.
(Dr T. Yoshida, The University of Tokyo, Department of Metallurgy and Materials Science, Faculty of Engineering, Bunkyo-ku, Tokyo 113, Japan.)

Vapor–Liquid Equilibria

9–10 September. 3rd International Workshop on Vapor–Liquid Equilibria in 1-Alkanol + *n*-Alkane Mixtures. Budapest, Hungary.
(Dr H. V. Kehiaian, Laboratoire de Chimie Organique Physique, Institut de Topologie et de Dynamique des Systèmes, Université Paris VII — CNRS, 1 rue Guy de la Brosese, F-75005 Paris, France.)

CHEMRAWN IV

4–9 October. Modern Chemistry and Chemical Technology Applied to the Ocean and its Resources. Colorado, USA.
(Dr Derek W. Spencer, Associate Director for Research, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, USA.)

1988

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1–5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubère, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-les-Nancy Cédex, France.)

Modified Polymers

5–8 July. 7th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia.
(Dr A. Romanov, Polymer Institute CCR of the Slovak Academy of Sciences, 842 36 Bratislava, Czechoslovakia.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and Physical Phenomena in the Ageing of Polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Photochemistry

17–23 July. 12th International Symposium on Photochemistry. Bologna, Italy.
(Prof. V. Balzani, Dipartimento di Chimica, Università degli Studi, Via Selmi 2, 40126 Bologna, Italy.)

Poly(Vinyl Chloride)

18–21 July. 31st Microsymposium on Macromolecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(Dr P. Čefelín, Deputy Director, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto 606, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Mycotoxins and Phycotoxins

16–19 August. 7th International Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Nator, Maiji College of Pharmacy, 1-22-1, Tanashi-shi, Tokyo, Japan.)

Physical Organic Chemistry

21–27 August. 9th International Conference on Physical Organic Chemistry. Regensburg, Federal Republic of Germany.
(Prof. J. Sauer, University of Regensburg, Institut für Organische Chemie, Universitätsstr. 31, D-8400 Regensburg, Federal Republic of Germany.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena. Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Department of Chemistry, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

Coordination Chemistry

29 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. J. de O. Cabral, Department of Chemistry, Faculdade de Ciencias, 4000 Porto, Portugal.)

1989

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Dr J. D. R. Thomas, Applied Chemistry Department, UWIST, PO Box 13, Cardiff CF1 3XF, UK.)

IUPAC CONGRESS

2–7 August. 32nd International Congress of Pure and Applied Chemistry. Stockholm, Sweden.
(Dr Bengt Karlsson, The Swedish Chemical Society, Wallingatan 26A, 5-111 24 Stockholm, Sweden.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Department of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

1990

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, FRG.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

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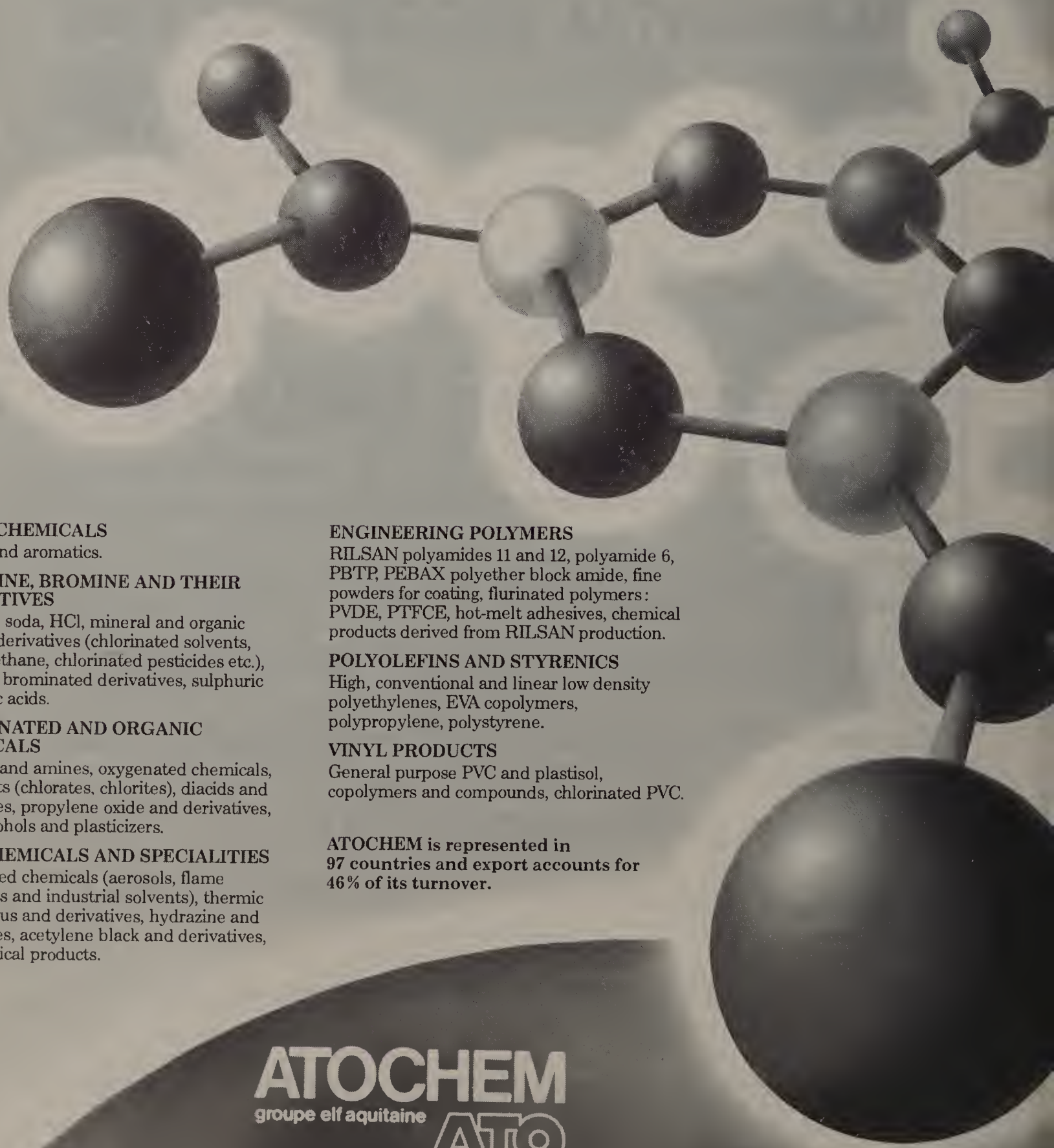

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Compiled for the Commission of Physicochemical Symbols, Terminology, and Units, Physical Chemistry Division, International Union of Pure and Applied Chemistry, by K.Homann, Darmstadt.

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IUPAC

Based on the more comprehensive IUPAC document **Quantities, Units and Symbols in Physical Chemistry,** to be published later this year, this laminated list is intended as a ready reference to the symbols most frequently used by authors, teachers and students in chemistry and related disciplines. It is an invaluable information source on the internationally recommended symbols for the most important physical quantities and units used by chemists and includes such subjects as: base SI units and physical quantities, SI prefixes, SI derived units with special names and symbols, recommended symbols for commonly used physical quantities, units outside the SI and values of some fundamental constants.

Outline of Contents: Base SI units and physical quantities; SI prefixes; Examples of SI derived units with special names and symbols; Recommended symbols for commonly used physical quantities; Units outside the SI; Values of some fundamental constants; References.

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Edited by **L.R.P. Butler**

Analytical chemistry is extremely important for the mineral industry, as it is a research method used not only in the exploration and exploitation of mineral deposits, but also in the processing of materials. This volume contains the invited lectures presented at the *2nd International Symposium on Analytical Chemistry in the Exploration, Mining and Processing of Materials* which was held in South Africa in 1985. The aim of the symposium was to highlight the importance of analytical chemistry in the production of materials, such as coal, ferrous and non-ferrous metals, ceramics and precious metals, from the initial stages of exploration and assessment of ores to their beneficiation and, finally, to the refined product. This volume will be equally valuable to anyone working in fields related to the quality of materials, such as analytical chemists, mineral physicists, metallurgists, geologists, and chemical and mining engineers.

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Reference materials
Elemental analysis of coal
Analysis of ceramic materials
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Analysis of gold, silver and platinum group materials.

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The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, non-governmental, non-profit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

- to promote continuing co-operation among the chemists of the member countries;
- to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
- to co-operate with other international organizations which deal with topics of a chemical nature;
- to contribute to the advancement of pure and applied chemistry in all its aspects.

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Chemistry International

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Front cover: Tokyo: venue of CHEMRAWN VI Conference on Advanced Materials for Innovations in Energy, Transportation & Communications.

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Editorial

Super-enthusiasm conducted in Tokyo

Not one of the 600 participants who attended the CHEMRAWN VI Conference on Advanced Materials for Innovations in Energy, Transportation and Communications held at the Toshi Center, Tokyo in May, can have any doubt that the key word at the conference was "super". Not only was there an abundance of papers on superalloys, superlattices, superplastics and, of course, superconductors, but also, the meeting was superbly organized. Above all, the super enthusiasm and excitement at the meeting was self-evident to all who attended. But why?

Toshi Center, Tokyo, venue of CHEMRAWN VI.

One of the underlying reasons must be the very nature of CHEMRAWN. As Bryant Rossiter explained in his lecture at the closing ceremony: "CHEMRAWN has been designed to bring together the separate cultures of the various scientific disciplines, industries, universities and governments". This certainly occurred most successfully in Tokyo, where decision makers from government and industry met together with experts on advanced materials.

Even several weeks after the conference, phrases such as "major technological breakthrough" and "developments which will have a pronounced social and economic impact" are still ringing in my ears. There was certainly a feeling in the air that we are all on the threshold of a major scientific and technological revolution.

One of the aims of CHEMRAWN is to accelerate the implementation of research priorities by fostering cooperation among governments, industries and universities. Advanced materials are certainly going to make a tremendous impact on all our lives over the next decade or so. There can be few leaders or decision makers at CHEMRAWN VI who could have failed to receive this message or who could have failed to be impressed by these developments.

A tribute

According to President Rao in his "State of the Union" report presented at the 34th General Assembly in Boston, CHEMRAWN VI was outstanding: "This was a trendsetting conference dealing with an area of utmost importance to the world today. I only wish that more people had attended . . ."

CHEMRAWN VI was also a fitting tribute to Bryant Rossiter whose term of office as Chairman of the CHEMRAWN Committee had, according to the rules of office, to terminate at the end of 1986. It is therefore perhaps appropriate here to repeat the following statement from Secretary General Tom West's column in the previous issue of *CI*: "much, if not most, of CHEMRAWN's success is due to Bryant's phenomenal pioneering energy and drive. CHEMRAWN, IUPAC and the social conscience of chemistry is greatly indebted to him".

The primary aim of science is the establishment of peace through the betterment of mankind. . . . CHEMRAWN is a process for building bridges between peoples whose hopes, dreams, and aspirations for a healthier, happier, more peaceful life are essentially the same regardless of country of origin. — Bryant Rossiter at CHEMRAWN VI, Tokyo.

Opinions expressed here are those of the author and do not necessarily reflect the views or policy of IUPAC.

Superquotes

- The discovery of superconductivity above liquid nitrogen temperature is indeed staggering. — C. N. R. ("Ram") Rao (*CI*, p. 174, September 1987).
- Research on "high-temperature" superconductors — one of the most exciting developments in scientific research of recent years. — Tom West (*CI*, p. 177, September 1987).
- In the course of preparing this paper, the news reached us of the discovery of a superconductor with a Tc of 98K — an extraordinary breakthrough . . . which may lead to profound technological and sociological changes throughout the world. — Toru Imura (at CHEMRAWN VI, *see* p. 220).
- The most recent ceramic miracle is the demonstration of high Tc superconducting properties. — H. Kent Bowen (at CHEMRAWN VI, *see* p. 223).
- Superconductivity: Current-carrying capacity soars . . . yet another milestone in the fast-paced research effort that has surrounded these materials for the past six months. — (*C&EN*, p. 4, May 18, 1987).
- A new electrical revolution: Better living through superconductivity . . . billions of dollars and a chance to transform the worldwide industrial economy are at stake. — (*Newsweek*, p. 47, May 25, 1987).
- Superconductor race: Already the first sample wires based on yttrium–barium–copper oxide have been produced. — (*Chemistry in Australia*, p. 186, June 1987).
- One thing that everyone agrees on, if only because so many claims that appeared to be farfetched have already been borne out, is that superconducting at room temperature is possible. Rumours have abounded. — (*Scientific American*, p. 30, June 1987).
- Superconductor research warms up. — (*New Scientist*, p. 27, 4 June 1987).
- Hot superconductors force a change in theory. — (*New Scientist*, p. 37, 18 June 1987).
- Superconductivity — what's all the fuss about? On 18 March this year around 3000 physicists jammed into the New York Hilton to hear about oxide ceramics — a completely new class of superconductors. The excitement and anticipation of the crowd has been compared to that of a rock concert and the significance of these materials described as the most exciting development in physics since the invention of the transistor. A month later, at the American Chemical Society meeting in Denver, almost 1000 chemists rushed to a special unscheduled tutorial to find out "what all the fuss was about". — (*Chemistry in Britain*, p. 513, June 1987).
- The latest theory I've heard is that they're pieces of the supernova that have fallen to the Earth. — Robert J. Cava (*Scientific American*, p. 29, June 1987).

The year of the superconductor

CHEMRAWN stands for CHEMical Research Applied to World Needs. The 6th Conference was concerned with the current and future uses of various types of advanced materials for energy, transportation and communications. These materials include genetically engineered materials, composites, semiconductors, ferroics, fibres, ceramics and so on. However, if there was one material which took the meeting by storm, it was superconductors.

On the opening day of the conference IUPAC Vice-President Valentin Koptyug took me aside and whispered in my ear: "I hope *Chemistry International* will be able to do something on superconductors". And then, on the following day, President "Ram" Rao switched from his prepared text and, bubbling over with excitement, delivered an up-to-the-minute account of the latest developments in superconductor research.

A world conference on advanced materials for innovations in energy, transportation and communication was therefore most timely in a year which has seen major breakthroughs in superconductivity combined with almost unparalleled excitement (see Box). CHEMRAWN VI may certainly be regarded as one of the highlights in the year of the superconductor.

ISCUed again!

When I attended the ICSU General Assembly in Berne, Switzerland, last year, ICSU's Executive Secretary Mike Baker kindly reminded me of the time when *Chemistry International* had referred to the International Council of Scientific Unions as "ISCU" in a headline (see *CI*, p. 25, August 1983). When I took over from Roger Fennell as Editor of *CI*, I vowed that I would never allow such a "misacronym" to appear on the pages of *CI* again. Yet it has — and not just once, but twice! (see *CI*, p. 102, May 1987). Once more, apologies to Mike Baker and ICSU.

News & Views

Federation of European Chemical Societies (FECS) General Assembly

At the 18th General Assembly of FECS in Paris on 18–19 June 1987, applications for membership were accepted from Asociación Nacional de Químicos de España, Chemical Section/Academy of the Socialist Republic of Romania, Chemische Gesellschaft der DDR, and Sociedade Portuguesa de Electroquímica. There are now 37 member societies from 27 countries.

Written reports were received from the Working Parties on Professional Affairs, Chemical Education, Organometallic Chemistry, Chemistry and the Environment, History of Chemistry, Analytical Chemistry, Food Chemistry. Interface papers were tabled by the Professional Affairs WP on "Links between Chemical Industry and Higher Education" and "Image of Chemistry". The latter will be updated annually to monitor progress on the recommendations and national reports will be collected by the Royal Society of Chemistry in London.

Working Parties on Electrochemistry and on Interfacial Phenomena were officially inaugurated. The intended activities of the Discussion Group on Chemistry for Developing Countries will be focused in a collection point for relevant documentation and for its distribution, which will be undertaken by the Royal Society of Chemistry.

A status report was presented on "Interface-University/Chemical Industry" and material will continue to be collected by Dr R. Darms (Switzerland). A proposal from Italy was accepted to form a Discussion Group on Chemistry in Conservation of the Cultural Heritage. In view of the failure of the earlier Association of Editors of European Chemical Journals, some doubts were expressed at a suggestion from Italy to initiate European Cooperation on Editorial Activity. On the other hand, there was support for a French initiative on "European Symposia in Print".

The home of Société Française de Chimie (250 Rue Saint-Jacques, Paris), where FECS met. This house was presented to the Society on his death by Le Bel who, simultaneously with van't Hoff in 1874, made the first explanation of optical activity in organic chemistry.

Prof. S. Pasynkiewicz (Polish Chemical Society) receives from Prof. G. Jommi (Chairman, FECS Council) the 1987 FECS Award for his work as initiator and Chairman of the Working Party on Organometallic Chemistry. The background painting features Mr Claire Deville, one of the first to produce significant amounts of reasonably pure metallic aluminium which was at that time more expensive than gold!

Dr Gábor Náray-Szabó (incoming) and Dr Áron Jakabos (outgoing joint FECS Secretary General, Hungarian Chemical Society): Dr Jakabos has now left Europe to work in Nigeria.

The first Eurasian Chemical Conference, a joint venture of FECS and the corresponding Asian Federation (FACS), will now be held on the Baghdad University campus during 16–21 November 1988 (Organizing Committee, Iraqi Chemical Society, POB 8011 Salihiyah, Baghdad, Iraq).

M. Williams

Harmonization workshop

The IUPAC Working Party on the Harmonization of Collaborative Analytical Studies held a workshop from 4 to 5 May 1987 in Geneva, Switzerland (see *CI*, pp. 95–96, May 1987). The purpose of the workshop, which was hosted by the International Standards Organization (ISO), was to discuss a harmonized protocol for the design, conduct and interpretation of collaborative analytical studies. The workshop agreed on the following items:

- Preliminary estimates of precision and systematic error should be obtained within a single laboratory before conducting the collaborative study. Such testing should provide estimates of the total within-laboratory standard deviation of the analytical results over the concentration range of interest — as a minimum, at the upper and lower limits of that range, with particular emphasis at any standard or specification value.

The Geneva Workshop discussed a harmonized protocol for the design, conduct and interpretation of collaborative analytical studies.

- A collaborative study determines the performance characteristics of a method.
- A standard set of symbols and terms for designating parameters in a collaborative study should be used.
- Instructions to participants in collaborative studies must indicate the number of significant figures to be reported, based on the output of the measuring instrument.

Dr 'Mo' Williams (IUPAC), Mr Mike Baker (ICSU) and Dr John Kingston (UNESCO) at the ICSU Secretariat in Paris on 17 June 1987 to discuss progress towards an IUPAC– UNESCO initiative in Latin America.

- The minimum number of materials to be used in a collaborative study is five, however, when a single level specification is involved this may be reduced to an absolute minimum of three.
- Within-laboratory precision estimates should preferably be obtained by split-level and blind replicate designs.
- The minimum number of participating laboratories in a collaborative study is eight. Only when it is impossible to obtain this number, may the study be conducted with less, but with an absolute minimum of five laboratories, with the accompanying expansion in the confidence limits of the precision.
- The results of collaborative studies must be analysed by one-way analysis of variance (ANOVA). More complex analyses are not precluded, but the fundamental one-way ANOVA is compulsory to estimate the components of variance.
- The precision estimates are to be calculated (a) with no outliers removed and (b) with outliers removed first by the Cochran test and then the Grubbs test, both at the 0.01 probability level.
- The final report must include all reported valid data.
- When s_r is greater than s_R, make them equal; calculate recovery as (found — original)/added; report analytical results uncorrected for recovery.

The protocol was submitted to the 34th IUPAC General Assembly in Boston with the aim of publishing it as a IUPAC recommendation.

We regret to record the death of:

Prof. G. Terui, Japan (28 May 1986) — Commission on Biotechnology (1969–1975).

Unusual names assigned to chemical substances

Dr W. V. Metanomski

Each year some 400 000 new chemical substances are added to the Chemical Abstracts Service (CAS) Chemical Registry System. Some of these are assigned unusual names. For example, the hydrocarbon "congressane" was named after the 19th IUPAC Congress held in London in 1963. In this paper* Dr W. Val Metanomski, Manager of Editorial Development at CAS, looks at a small selection of these unusual and interesting names.

Dr W. Val Metanomski, Manager of editorial development at Chemical Abstracts Service, Columbus, Ohio, USA, reviews poster papers. He is a member of the Working Party on Ladder Polymer Nomenclature of the IUPAC Commission on Macromolecular Nomenclature.

The language of chemistry, its origin, and its development over the years from the time of the alchemist to the present provides a fascinating story.[1] Long before scientists had discovered the chemical composition of various compounds found in nature, isolated from rocks, or from materials of animal or plant origin, they named substances for their physical properties, such as colour, consistency, crystalline form, taste, and smell. Names of people, place names, medicinal properties, and methods of preparation constituted other considerations for chemical terminology.

As the number of substances to be differentiated and named grew and as knowledge about their chemical composition became established, scientists began to realize an obvious principle of chemical nomenclature: that compounds' names should be related to their constituents. The development of systematic chemical nomenclature, started by Torbern Bergman (1735–1784), Louis-Bernard Guyton de Morveau (1737–1816), Antoine-Laurent Lavoisier (1743–1794), Claude-Louis Berthollet (1748–1822), and Antoine-François Fourcroy (1755–1809), continues to this day, mainly through the work of the IUPAC Commissions on Nomenclature (e.g. Organic, Inorganic, and Macromolecular). The history of organic chemistry nomenclature covering the period from the 1892 Geneva Conference to 1979 has recently been published[2] (see *CI*, pp. 27–28, August 1986).

Despite the obvious need for systematic nomenclature based on chemical composition to describe unambiguously specific chemical compounds, scientists cannot resist the temptation of using short names, especially for complex molecules. In fact, over the last twenty to thirty years, names based on the *shape* of structures have become quite the vogue, especially in organic chemistry. Obviously, this is because chemists find the appropriate systematic names to be too long, complex, and cumbersome, and also because devising entertaining names satisfies their sense of inventive humour. I am indebted to Professor Otis C. Dermer of the Oklahoma State University for suggesting the term *morphodelotic* for these shape-descriptive names.

To gain an historical perspective on the number of existing ring systems and unique specific chemical substances, consider that the *Ring Index*, published in 1940, contained just over 4000 ring systems. Today, the CAS *Ring System Handbook* and its supplements list nearly 67 000 ring systems, with the largest ring system containing 61 rings (**tricircumcoronene**, *95329-09-2*) and the largest single-ring system containing 288 carbon atoms (**cyclooctaoctacontadictane**, *68646-60-6*).

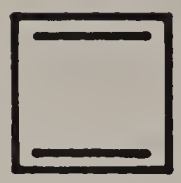
Chemists estimate that there were 1 300 000 specific chemical compounds in existence in 1930. Today, 400 000 new chemical substances are added to the CAS Chemical Registry System *each year* and the total number of known chemical compounds since the beginning of chemical records may number 10 000 000.

Most of the names mentioned below are well-accepted trivial names and are available for searching in various chemical dictionaries, both printed and online. The most convenient link between the common or trivial name, the systematic name, and the chemical structure is the CAS Registry Number, which is also listed below, accompanying each structure and name. If you are interested in obtaining more information about these substances, such as the systematic name and references to the original literature, you can obtain it by using the CAS Registry Number to access the CAS ONLINE CA FILE and other online files derived from CAS publications and services.

*This paper was presented in part at the "Chemistry Trivia" poster session before the Divisions of the History of Chemistry and Chemical Education, 191st National Meeting of the American Chemical Society, New York, N.Y. 14 April 1986.

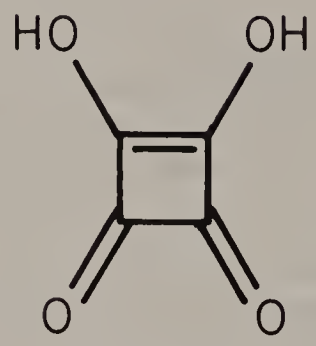
The following are simple single-ring cyclic structures:

(1)



[4]annulene
1120-53-2

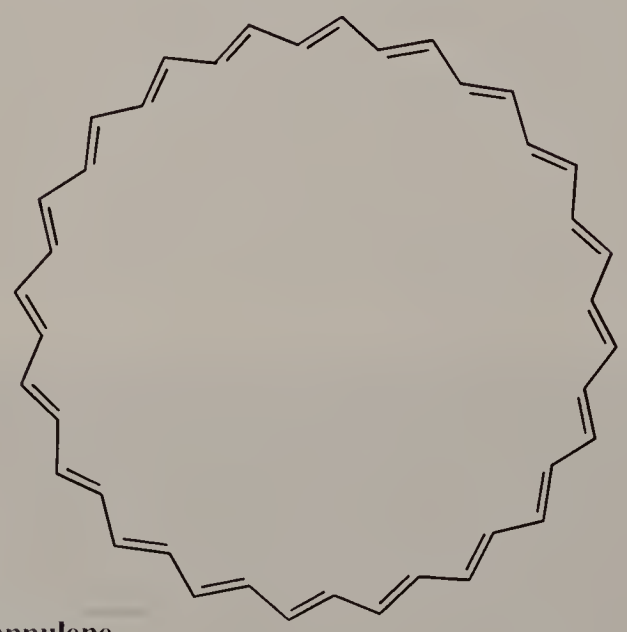
(2)



squaric acid
2892-51-5

These structures can be as small as the ones shown above and as large as the following:

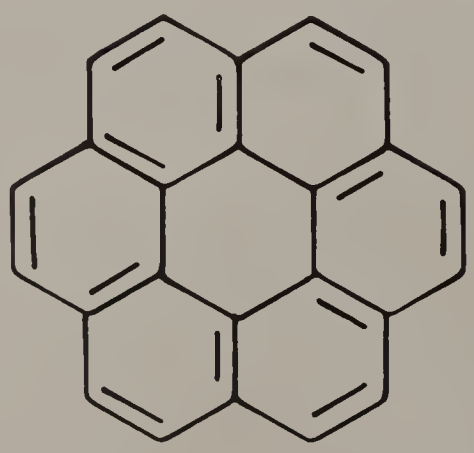
(3)



[40]annulene
55757-00-1

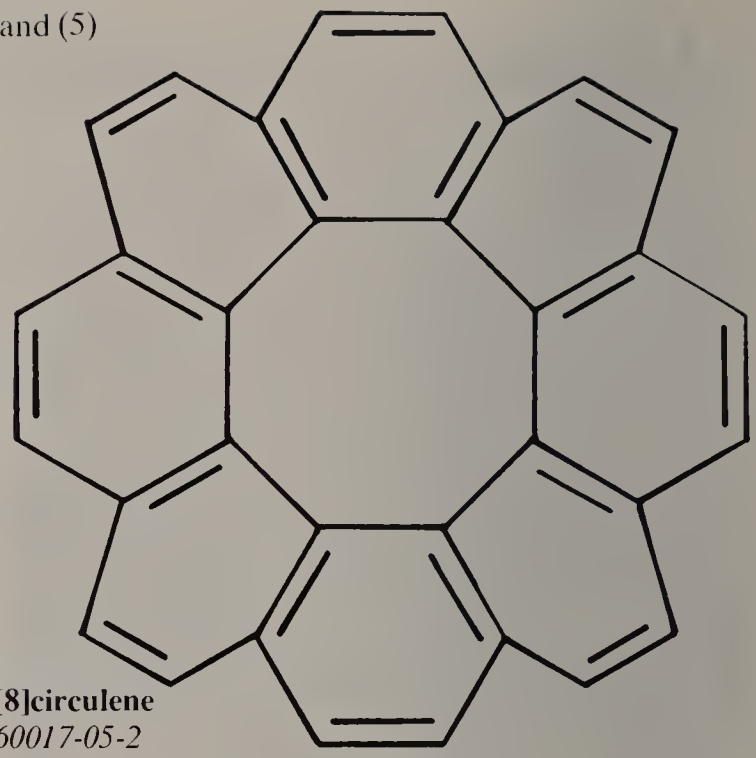
Structures can also consist of units such as these two cyclic multi-ring structures:

(4)



coronene
191-07-1

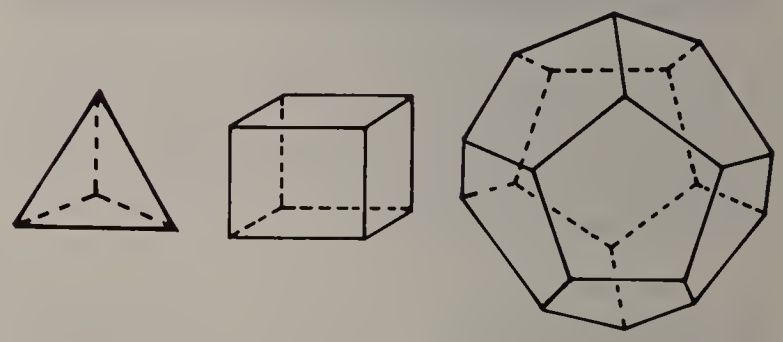
and (5)



[8]circulene
60017-05-2

Names based on shape have often been assigned to three-dimensional solid-like structures such as the following:

(6) (7) and (8)



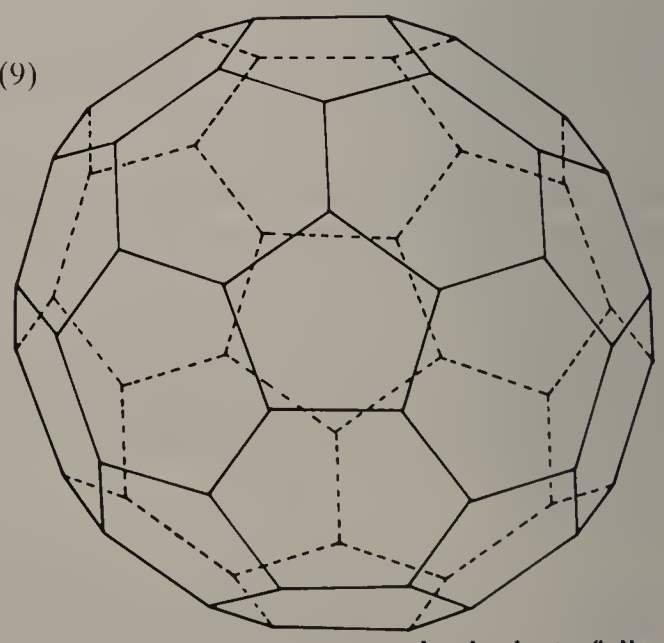
tetrahedrane
157-39-1

cubane
277-10-1

dodecahedrane
4493-23-6

There is also a football- or soccerball-like structure (depending whether you are in the UK or USA).

(9)

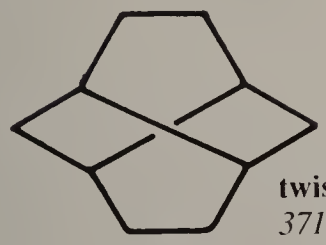


buckminsterfullerene
99685-96-8

This substance was named as a geodesic network rather than a regular solid, truncated icosahedron. Other suggested synonyms for this C_{60} cluster are footballene, soccerballene, soccerene, and carbosoccer. The hydrocarbon counterpart has not been synthesized as yet, but the suggested names are already in place: footballane and soccerane. Its complete IUPAC name, after several trials and tribulations, has also been published!

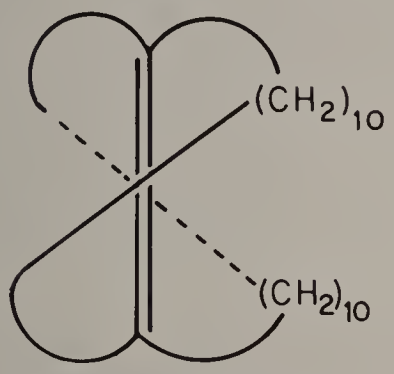
Twists and turns in structures are represented by these shapes:

(10)



twistane
37165-27-8

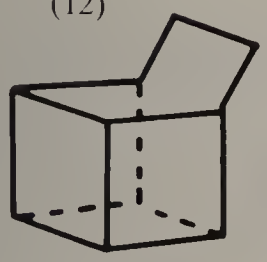
and (11)



[10.10]betweenanene
63269-60-3

The names of the following structures reflect their resemblance to useful articles:

(12)



basketane
5603-27-0

(13)

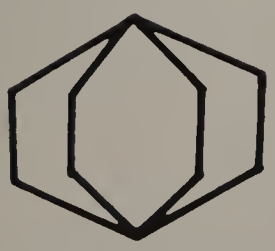
fenestrane
40220-30-2

and (14)

broken window
75889-02-0

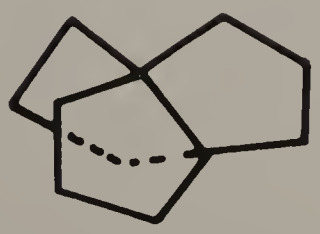
The following structures remind us of tools of locomotion:

(15)



[2.2.2.2]paddlane
78424-60-9

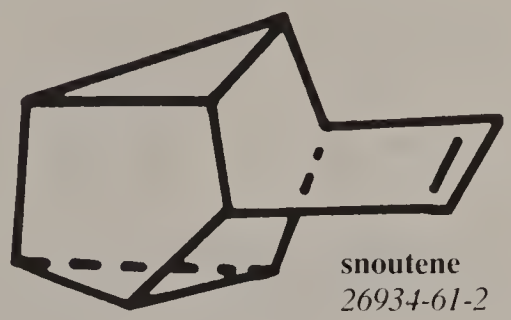
and (16)



[3.3.3]propellane
51027-89-5

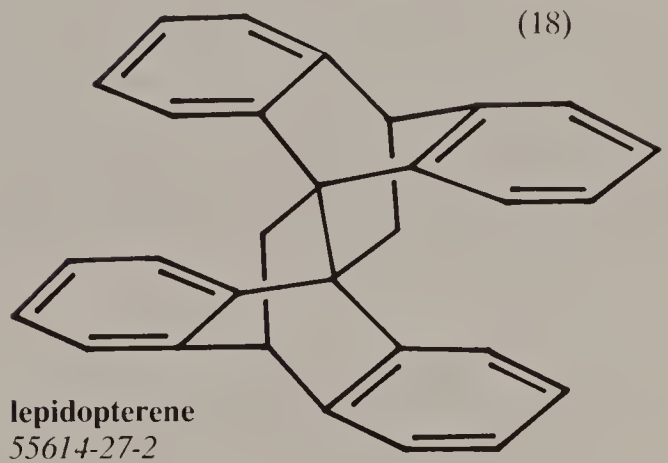
A few researchers have seen characteristics of animals in the shapes of some substances:

(17)



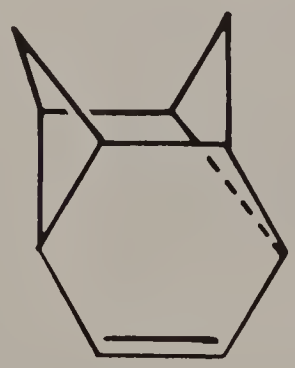
snoutene
26934-61-2

(18)



lepidopterene
55614-27-2

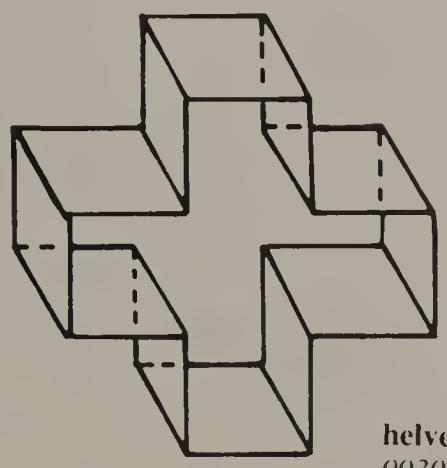
and (19)



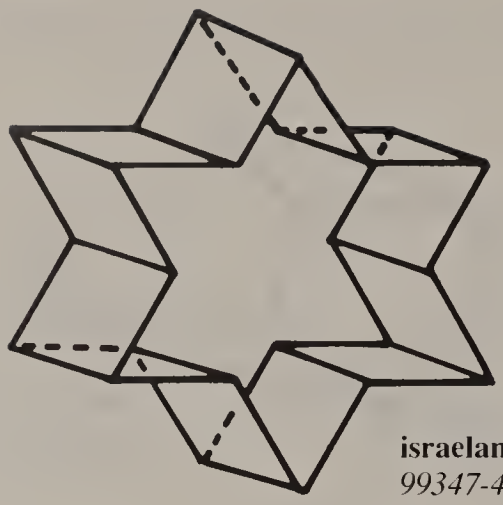
felicene
59275-46-6

World politics has not escaped chemists' attention. The following two compounds, while proposed in jest, have their predicted properties studied nevertheless.

(20)



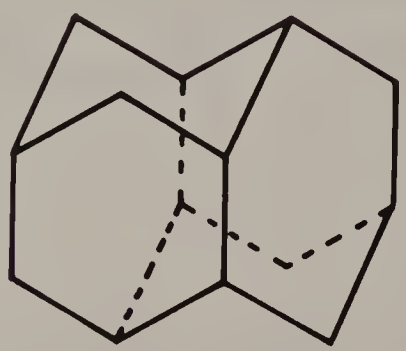
helvetane
99396-93-7



israelane
99347-43-0

Once an IUPAC Congress itself contributed to the pantheon of unusual chemical names. The 19th IUPAC Congress adopted a hypothetical compound, a diamond-lattice hydrocarbon, as the emblem of their meeting in London in 1963 and featured it as a decoration on the cover of their abstracts. Shortly afterwards, it was successfully synthesized.

(22)



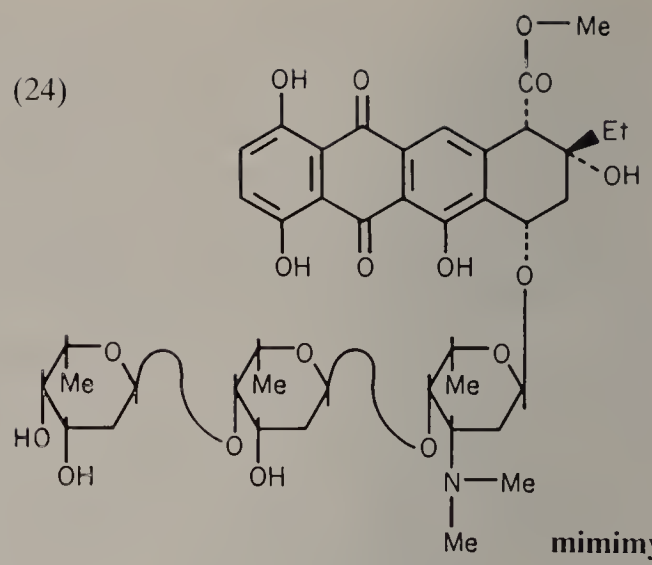
congressane (diamantane)
2292-79-7

It also turns out that chemical compounds need not necessarily remind the researcher of some familiar shape or event to receive a colourful trivial name. Often it happens that a researcher has a favourite topic and chooses names derived from that field. For example, a group of chemists at the Bristol Laboratories in Syracuse, New York, headed by Dr Terence W. Doyle were enthusiastic operatic fans and found inspiration in the characters of one of their favourite operas. It was, in fact, Dr Doyle's coworker, Dr Donald E. Nettleton, who proposed Puccini's opera *La Bohème* and its protagonists as the source for the names of an antibiotic complex and its components[3]. Thus, we have

(23) antibiotic complex

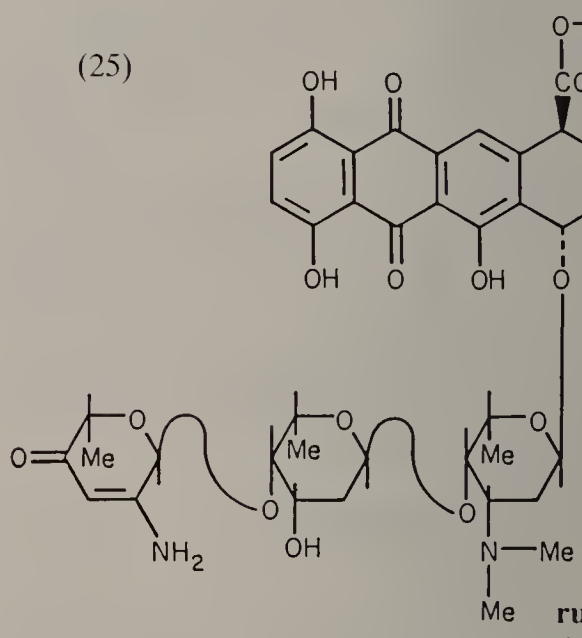
bohemic acid
64296-23-7

(24)



mimimycin
72657-06-8

(25)



rudolphomycin
69245-38-1

(26)

alcindoromycin
72586-21-1

(27)

collinemycin
72598-49-3

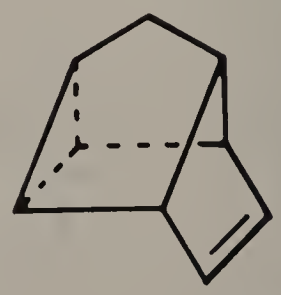
(28) and (29)

marcellomycin
63710-10-1

musettamycin
63710-09-8

Finally, one does not always need to have such an exalted excuse or reason for deriving a name. One might just get tired of naming. Thus, we also have the substances

(30)



george (deltacyclene)
7785-10-6

bigeorge
7781-75-1

and (31)

The examples cited in this article are but a small selection of unusual and interesting names. If you are interested in learning about other such names, as well as finding out in some detail how and why trivial names are selected and promoted, you should watch for a forthcoming book on this subject by Professors Alex Nickon of the Johns Hopkins University, and Ernest F. Silversmith of the Morgan State University, Baltimore, Maryland[4].

References

1. Crosland, M. P., 1978. *Historical Studies in the Language of Chemistry*, 406 pp. Dover Publications, New York.
2. Verkade, P. E., 1985. *A History of the Nomenclature of Organic Chemistry*, 507 pp. D. Reidel Publishing Co., Dordrecht, Holland.
3. Doyle, T. W. *et al.*, 1979. *J. Am. Chem. Soc.* Vol. 101, pp. 7041–7049.
4. Nickon, A. & Silversmith, E. F., 1987. *Organic Chemistry — The Name Game. Modern Coined Terms and Their Origins*, Pergamon Books, Inc., New York.

Is this a record?

The systematic name for the antibiotic efrotomycin A_2 contains 417 characters (including parentheses, brackets, hyphens, commas, etc.). On p. 34 of August 1986 issue of *CI* we asked "is this a record for the length of a systematic name of a chemical compound?"

Dr Metanomski, author of the previous paper, has informed us that the answer is no. The longest *CA* Index name contains 1578 characters:

Adenosine, *N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)adenylyl-(3'→5')-4-deamino-4-(2,4-dimethylphenoxy)-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-4-deamino-4-(2,4-dimethylphenoxy)-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[4-dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[[4-(dimethylethyl)phenyl]acetyl]-2'-*O*-(tetrahydromethoxypyranyl)guanylyl-(3'→5')-*N*-[[4-(dimethylethyl)phenyl]acetyl]-2'-*O*-(tetrahydromethoxypyranyl)guanylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)adenylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-4-deamino-4-(2,4-dimethylphenoxy)-2'-*O*-(tetrahydromethoxypyranyl)-cytidylyl-(3'→5')-4-deamino-4-(2,4-dimethylphenoxy)-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[[4-(dimethylethyl)phenyl]acetyl]-2'-*O*-(tetrahydromethoxypyranyl)guanylyl-(3'→5')-4-deamino-4-(2,4-dimethylphenoxy)-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)adenylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2'-*O*-(tetrahydromethoxypyranyl)cytidylyl-(3'→5')-*N*-[4-(dimethylethyl)benzoyl]-2',3'-*O*-(methoxymethylene)-, octadecakis(2-chlorophenyl) ester, 5'-[2(dibromomethyl) benzoate]

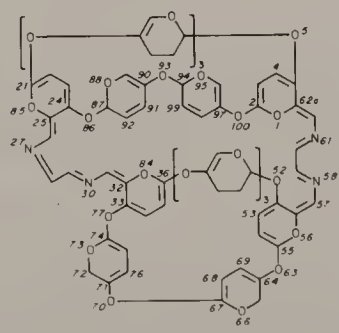
86417-45-0

$C_{601}H_{678}Br_2Cl_{18}N_{56}O_{184}P_{18}$
CA 99:38770h (1983)

The name is in the "inverted" format, that is, in the format employed in the *CA Chemical Substance* and *Formula Indexes*. The name was displayed as part of the poster paper "Record-Setting Features of Chemical Substances in the CAS Database" presented at the "Chemistry Trivia" poster session before the Divisions of the History of Chemistry and Chemical Education at the 191st American Chemical Society's National Meeting in New York, N.Y., on 14 April 1986. The poster was a companion poster to the "Unusual names Assigned to Chemical Substances" poster (see above).

The following are the other records presented in the poster. These records refer to the Chemical Abstracts Service database. There might be longer names reported elsewhere.

The longest Wiswesser Line Notation (749 characters)

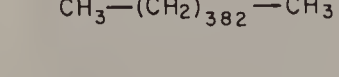


T E6 J6 O6 T6 B&6 G&6-35-6 U&6 E&&6 J&&6 C-44-O---------6 T&&6 B&&&6 G&&&6 U&-35- E--H J--M/O--R/T--W/B&--E&/G&--J&/CN& E&&--H&& J&&--M&&/O----------O&& T&&--W&& B&&&--E&&& G&&&--J&&&/W&K&&& A B D E- E- E-- E-- I J-J- J-- J-- N O- O- O---------- O--------- T- T-- B&- B&--G&- G&-- V& D&& E&&- E&&- E&&-- E&&-- I&& J&&-J&& J&&-- J&&-- N&& T&&- T&&-- B&&&- B&&&--G&&&- G&&&--- -15-CEHJMOO--O---------U&C&&E&&H&&J&&M&&O&& K&&& DO E-O IO J-O NO O-O O----N O-------N O----------O SO T-O A&O B&-O F&O G&-O K&O M&O P&N S&N V&O D&&O E&&-O I&&O J&&-O N&&O S&&O T&&-O A&&&O B&&&-O F&&&O G&&&-O K&&&O O--U O----U O------U O--------U T--U- W B&--U- E& G&--U- J& N&U P&U R&U T&U T&&--U- W&& B&&&--U- E&&& G&&&--U-J&&& EH JH E&&--H J&&--H&&&TTTT &&&&T&TTTTJ

70775-76-7

$C_{749}H_{966}N_4O_{278}$
CA 91 209221 (1979)

The longest aliphatic chain (384 carbons)



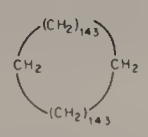
Tetraoctacontatrictane

$C_{384}H_{770}$

96118-85-3

CA 102:185585k (1985)

The largest single-ring parent (288 carbons)



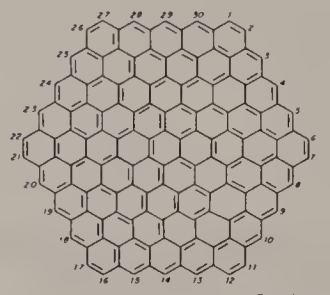
Cyclooctaoctacontadictane

$C_{288}H_{576}$

68646-60-6

CA 89:179585g (1978)

The largest ring system (61 rings)



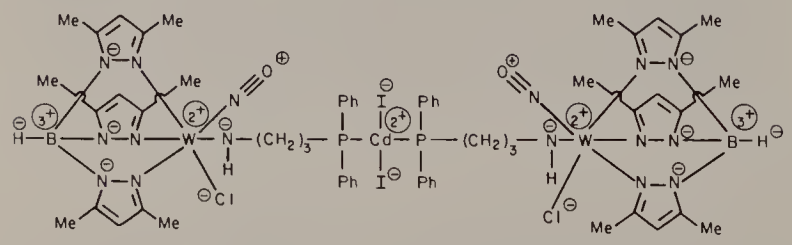
$C_{150}H_{30}$

95329-09-2

CA 102:112511y (1985)

Tricircumcoronene

The compound with most elements (10)



Tungsten, dichloro(diiodocadmium)bis[μ-[3-(diphenylphosphino)-1-propanaminato-*N P*]] dinitrosylbis[tris(3,5-dimethyl-1*H*-pyrazolato-*N*¹)hydroborato(1-)-*N*², *N*², *N*²]di-

87956-81-8

$C_{60}H_{78}Br_2CdCl_2I_2N_{16}O_2P_2W_2$

1 2 3 4 5 6 7 8 9 10

CA 99.224075k (1983)

A world record

According to the *1985 Guinness Book of World Records* (Revised American Edition, Sterling Publishing Co., Inc., New York, 1984, p. 140) the longest scientific name is the systematic name for deoxyribonucleic acid of the human mitochondria. This contains 16 569 nucleotide residues and is about 20 700 letters long.

This record is based on the paper by Anderson, S. *et al.* 1981. "Sequence and organization of the human mitochondrial genome", *Nature*, **290**(5806), 457–465. The paper presents the complete sequence of the 16 569 base pair human mitochondrial genome, expressed in terms of symbols for nucleotide residues such as A, C, G and T. The total of about 207 000 letters was simply calculated by estimating the average number of letters in the complete name of each residue such as "deoxyadenylyl", deoxycytidylyl" and so on. The complete name of the total sequence has not been printed anywhere.

The highest hypothetical element studied

Bibihexium
(Element of atomic number 226)

72536-87-9

Bbh

CA 92:65093b (1980)

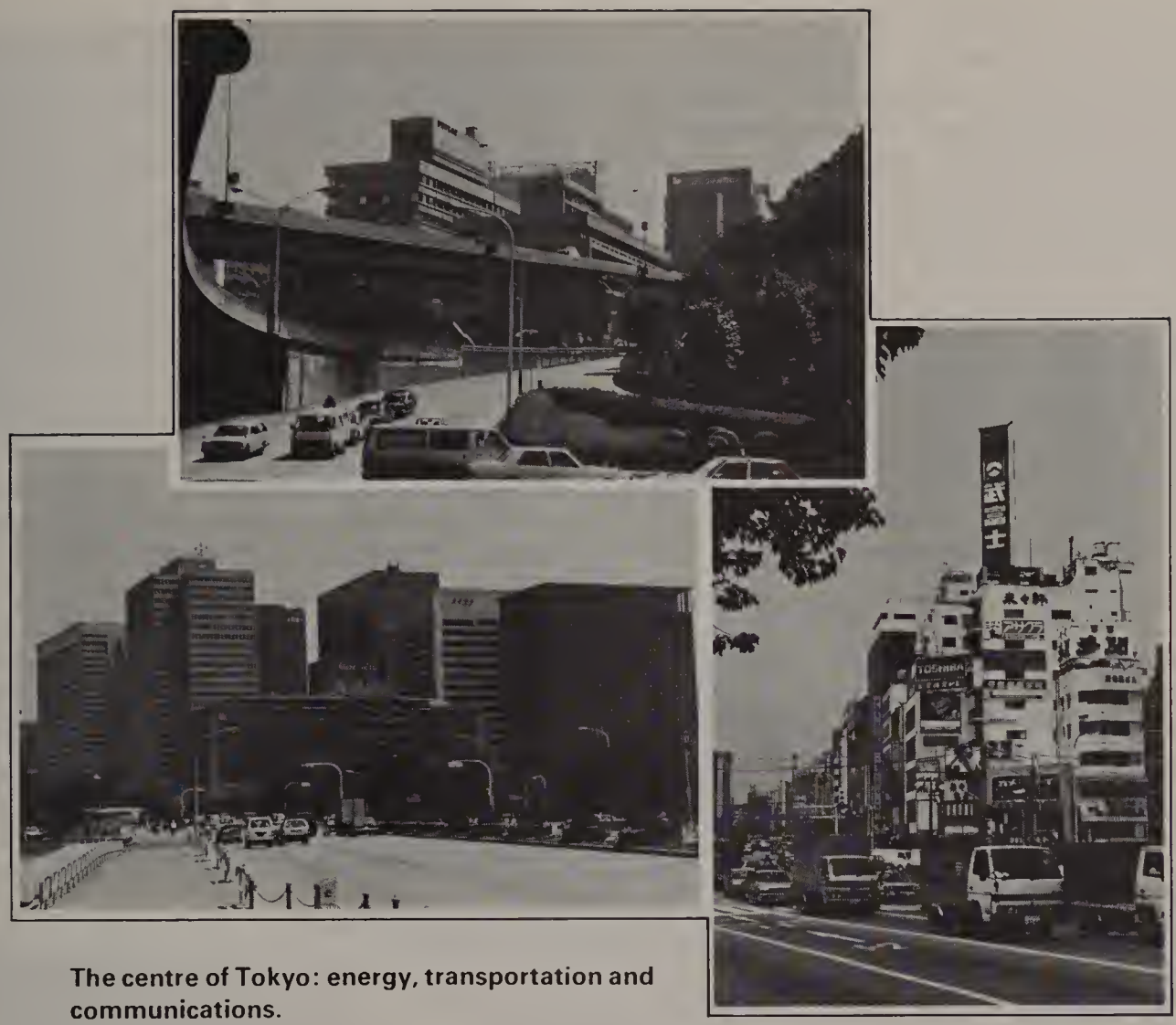
Advanced materials

Experts from around the world gathered at the CHEMRAWN Conference in Tokyo in May to present and discuss the latest findings on advanced materials for innovations in energy, transportation and communications. Superconductors were a feature of the conference and generated a lot of interest and excitement.

CHEMRAWN, which stands for CHEMical Research Applied to World Needs is the title of a series of IUPAC-sponsored conferences which aim to identify human needs — particularly those on a global scale — that may be satisfied through chemistry. The conferences are intended to provide a non-political, international forum for the collection, discussion, advancement, and dissemination of chemical knowledge deemed useful for the improvement of Man and his environment. They also aim to provide an international, non-governmental source of information for the benefit of research institutions, national governments, and international agencies concerned with chemistry and world needs.

CHEMRAWN VI on Advanced Materials for Innovations in Energy, Transportation & Communi-

Prof. Guang-Zian puts the final touches to his plenary lecture.



The centre of Tokyo: energy, transportation and communications.

cations was held at the Toshi Center, Tokyo, 17–22 May 1987 and was co-sponsored by The Science Council of Japan and The Chemical Society of Japan. Over 600 scientists attended the conference. These included over 120 scientists from overseas of which more than 20 were from developing countries.

At the opening ceremony, with CHEMRAWN Committee Member Dr Moriya Uchida presiding, leading Japanese scientists, politicians and industrialists delivered welcoming messages. These included a telegram message from the Prime Minister, Mr Yasuhiro Nakasone. IUPAC President, Prof. C. N. R. Rao presented the greetings of the Union.

After the opening session the following six plenary lectures were presented:

- Energy materials and human life (G. Porter, UK)
- Advanced materials and technology innovation (R. C. Forney, USA)
- Advanced technology materials for innovations in communication, energy and transportation: challenges in chemistry and problems of developing countries (C. N. R. Rao, India)
- European approach to advanced materials for innovations (K. H. Büchel, FRG)
- The development of rare earth research for advanced materials at Peking University (Xu Guang-Xian, China)
- The outlook for information and communications technology and its impact on human society (T. Sekimoto, Japan)

Over the next three days scientific sessions on energy, transportation and communications and information were run in parallel. There were also poster presentations.

On the last day of the meeting participants from the three scientific sessions reassembled for a

Dr Keichi Oshima, Chairperson of the CHEMRAWN VI Future Actions Committee introduces the "Crossing Session".

"crossing session". Representatives from each session presented overviews on material needs for energy, transportation and communication and information. Overviews were also presented on the feasibility of the following groups of materials: ceramics, metals, semiconductors, organics and polymers, and composites.

In the closing session, Dr Bryant Rossiter, who — after 12 years as Chairman of the CHEMRAWN Committee — is stepping down, presented a lecture on "The Activity and Role of CHEMRAWN". Topics under discussion for future CHEMRAWN conferences include post-harvest preservation of food, chemical plant safety, potable water supplies for developing countries, handling of chemical and urban wastes, acid rain and ozone layer depletion.

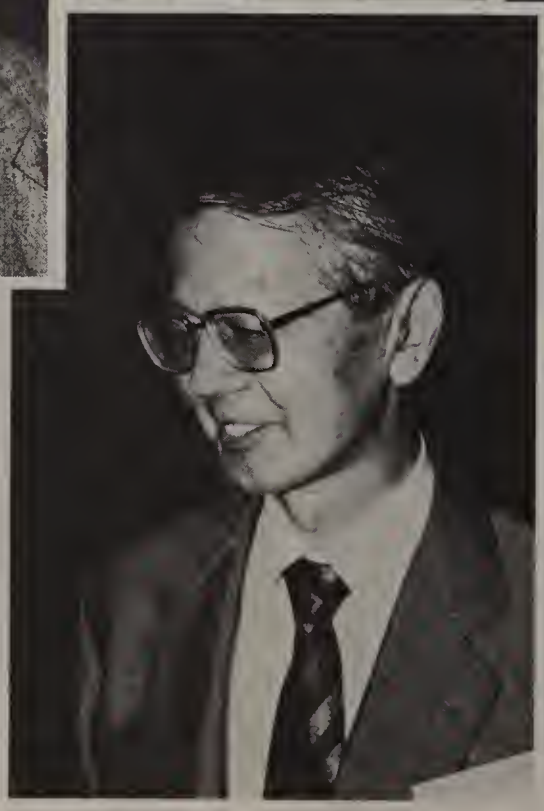
Dr Bryant Rossiter (hand against mouth) ponders the future of CHEMRAWN. On his left is Dr S. Varadarajan, Associate Member of the CHEMRAWN Committee.

Affiliates at CHEMRAWN VI

▲ Dr Michel Mégnamisi-Bélombé, University of Yaoundé, Cameroon, registered as the first Affiliate from Cameroon when he attended CHEMRAWN VI. He is now National Affiliate Membership Secretary for Cameroon.

◀ Ing. Luis E. Miramontes Cjárdenas is Subdirector de Investigacion Basica de Proceso at the Instituto Mexicano del Petroleo, Mexico.

▲ Dr Paul J. Chong, Korea Research Institute of Chemical Technology, Chung Nam, Republic of Korea. He is the 19th chemist in his country to register as an Affiliate this year.



Dr Hiroshi Hamada, Executive Director of the Chemical Society of Japan is National Affiliate Membership Secretary for Japan. ▶

The third great revolution

The human race today is experiencing its third great revolution. The first was the agricultural revolution, the second the industrial revolution. Today we see before us the information revolution, and the coming of an information society. The representative technology working to bring about this vast transformation is information and communications technology, centring on electronics. In the sense that information and communications technology makes it possible to strengthen man's intellectual ability in a way that the industrial revolution could not accomplish, it can be said to constitute the core technology of the information revolution.

Progress in information and communications technology has spurred the development of computers and communications, culminating in the fusion of the two. The result is "C&C," the integration of computers and communications. In the future, information and communications hardware will become ever more sophisticated as it incorporates the newest innovations in microelectronics, optoelectronics and even bioelectronics. The role that materials technology will have to play in this process will only continue to grow in importance. I sum this up in the expression, "Those who dominate materials, dominate the technology."

In the years to come, however, software will prove to be an even more important problem. Software is in effect "intangible material," and software technology will be crucially important to the information revolution.

Information and communications technology, that is, C&C technology, will work to create the information society (this future society can also be characterized as a C&C society). This momentous transformation will revolutionize the very structure of civilization itself. Needless to say, this also inevitably entails a radical reshaping of industrial structure. As Japan moves from an industrial society to an information society, it will have to upgrade its industrial activity accordingly by arming both its products and production processes with sophisticated software. In short, secondary industry must reinforce itself with information and soft-ware, evolving into what I have termed a "2.5 industry." Similarly, C&C will have a strong impact on employment. Fortunately, there seems to be no shortage of overall employment opportunities. What is needed, consequently, are comprehensive and sober policies on the national level to solve the problem of mistmatch in the nature of labour in an information society.

In the final analysis, it is our wisdom as a species that will determine whether or not the coming information society will be an attractive and beneficial one. In that sense, the information society challenges human wisdom and capability. I hope that, through forums such as the CHEMRAWN World Conference, the peoples of the world will be able to cooperate together in building a better society.

From a plenary lecture on "The outlook for information and communications technology and its impact on human society" presented at CHEMRAWN VI by Tadahi Sekimoto, President, NEC Corporation, Tokyo.

Superconducting materials

In 1911, it was found that when some metals and alloys were cooled below a few degrees above absolute zero, a state of zero resistivity appeared along with the ability to transport a large electrical current with no resistance, thereby producing a very strong magnetic field without generating joule heat. This achievement seemed very useful for energy transport and conversion in the future. Aiming for a practical use of those materials necessitated developing superconducting materials with high Tc and Hc (Tc: critical temperature for normal-superconducting state transition, Hc: critical field above which superconducting state is destroyed).

Development of superconducting compound materials has occurred in the last 75 years. However, because of the brittleness of the intermetallic compounds, special techniques are required to fabricate those compounds into wires or ribbons or to add plasticity to those materials. A basic study has been conducted by Izumi *et al.* in connection with the ductility improvement of Ni_3Al alloy.

The drastic ductility improvement by a small boron addition (boron is an interstitial element) was found in 1979 and interpreted as segregated boron atoms at grain boundaries modifying the electronic environments of boundaries and reinforcing boundary cohesion, thus suppressing intergranular fracture. Substituting a few percent of Mn or Fe for Al could improve the ductility of Ni_3Al too. This type of study is very important for future improvement of the deformability of superconducting intermetallic compounds.

Recently, techniques have been developed for fabricating A15 type Nb_3Sn and V_3Ga compounds successfully into multifilamentary wires by the so-called bronze process. Nb_3Al and other advanced superconductors which have a much superior high-field performance compared with Nb_3Sn and V_3Ga are now being developed using new fabrication techniques.

Poster viewing at CHEMRAWN VI.

Production of practical Nb_3Ge conductors, which have the highest Tc of 23K among intermetallic compound superconductors, is mainly based on the chemical vapour deposition (CVD) process, since the CVD has a larger film deposition rate than sputtering or vacuum evaporation techniques. However, there are many deposition parameters in this CVD process, such as gas flow rate, gas mixing rate, tape moving speed, reaction temperature, etc., which must be controlled as precisely as possible in order to obtain a uniform layer with high Tc and Jc (maximum current flow available in practical use).

The Tc of Nb_3Ge is closely related to its lattice constant. The smaller lattice constant produces the higher Tc. Studies to fabricate long Nb_3Ge tapes are being made at several laboratories and the synthesis of the Nb_3Ge tape with Tc of 20K and Jc of over 2×10^4A cm^{-2} at 20T has been successful in a reproducible manner. Now, in the case of Mo–N alloys produced by sputtering, a high Tc value of 29.3K is expected by the energy band calculation.

In the course of preparing this manuscript, astounding news reached us of the discovery of a superconductor with a Tc of 98K. This is far above the boiling point of liquid nitrogen, 77K. This achievement by Chu and Wu was accomplished with liquid nitrogen as the refrigerant and is about 10 times cheaper and 20 times more effective than helium. It opens the potential of wide-ranging technological applications including levitated trains, power generators and transmission lines without resistive losses and very large magnets for medical magnetic resonance imaging. This is an extraordinary breakthrough which may lead to profound technological and sociological changes throughout the world.

Until 1986, Tc remained below 23.2K, the Tc of Nb_3Ge found in 1973. However, since 1980, scientists in Switzerland, Japan, the University of Houston, the University of Alabama, AT&T Bell Labs and China have investigated oxides as possible materials to achieve superconductivity at warmer temperatures.

In spring 1986, an IBM Corp. group in Zürich, Switzerland, announced the possible observation of superconductivity in the 30K range in a mixture of metal oxides. Many papers have followed since then. On December 30, 1986, Chu submitted to the journal *Science* a report of the achievement of superconductivity under pressure at 52.5K. In addition, Chu has discovered that the temperature at which the phenomenon occurs increases dramatically with pressure. This pressure effect was wholly unexpected, since the theory of superconductivity as it stands does not predict it.

"An extraordinary breakthrough . . . a superconductor with a Tc of 98K . . . "

However, superconductivity at 98K was announced on 16 February 1987. This was achieved at normal atmospheric pressure and in a material system different from that first suggested by the Swiss group. Still many directions to search for better materials seem to exist and indications that superconductivity may occur at 240K was seen by Chu's group. The ultimate operating temperature of these new materials will probably be much nearer to room temperature than to absolute zero.

From a paper entitled "Research and development of advanced metallic materials — present and future" by Toru Imura (Nagoya University, Japan).

Superconductors for energy systems

The interest in superconducting materials for energy applications has been considerable in the last few decades, the possibility of transporting high currents without ohmic losses being very tempting. Much progress has so far been accomplished, but due to low transition temperatures it is necessary to use liquid He (at 4.2 K) as a cooling medium, which leads to complex and expensive devices. With industrial superconducting materials, i.e. NbTi and Nb_3Sn, the largest application to be envisaged for energy systems is for Tokamak fusion magnets and — perhaps — for magnetic separator magnetes or high-energy physics. Other applications have already been envisaged and experimentally investigated, but none of these systems has had a large success due to economical reasons. The only field where superconductivity has been so far applied at a large scale is the nuclear spin tomography for medical diagnostics.

Recent discoveries in the field of superconductivity have dramatically raised the interest in the application of superconducting materials in energy systems. Until 1986, the highest superconducting transition temperature, Tc, was 23.2 K in Nb_3Ge, as found in 1973 by Gavaler *et al.*

In 1986, Bednorz and K. A. Müller at IBM Zurich discovered superconductivity at 30 K in a new class of materials: the metallic oxides, in particular the compound $La_{1.8}Ba_{0.2}CuO_4$ having the $K_2N_iF_4$ structure, a layered pervoskite. The duplication of this result by researchers around the world has led to a revolution in the field of superconductivity. Meanwhile, Chu *et al.* substituted Y for La and found a transition temperature of 95 K in the compound Y-Ba-Cu-O. The composition of this compound has been given by Cava *et al.* as $YBa_2Cu_3O_{6.7}$, the precise number of oxygen vacancies being still uncertain. The fact that liquid nitrogen at 77 K can now be used as a cooling medium instead of liquid He (at T = 4.2 K) opens new possibilities. Practical examples are:

1. The transmission of electric power with zero loss with dc currents at low voltage, as well as for short distances over thousands of kilometres.
2. The production of permanent high-field, zero-loss magnets for industry, research and medicine. Here the applications reach from large-size

Prof. Kazuo Saito, President of the Inorganic Division and Member of the CHEMRAWN VI Organizing Committee.

Mr Masaaki Hirooka, Chairperson of the CHEMRAWN VI Programme Committee.

Dr Moriya Uchida, Member of CHEMRAWN VI Committee.

solenoids or large dipoles (for magnetic separation of ores) to solenoids for NMR scanning techniques.
3. Energy storage systems.
4. Trains floating on a magnetic cushion over their tracks.
5. Magnetohydrodynamic power generation.
6. Electrical machinery (generators, propulsion systems, motors).
7. Plasma containment in controlled thermonuclear fusion.
8. Computers, smaller and much faster than those now available.

The impressive number of applications listed above could easily be extended. However, it has to be taken into account that the superconducting oxides are far from being developed at an industrial level. It has indeed to be recalled that the time period between the discovery of NbTi and Nb_3Sn and the production of high-quality multifilamentary superconducting wires was of the order of 20 years. The Chevrel phase $PbMo_6S_8$ was discovered in 1974 but industrial wires will need another 3 to 5 years of intense development before being available, in spite of recent progress accomplished by many groups in Europe and Japan.

"One of the main reasons for the intense research in this field could be the possibility of electrical power transmission over thousands of kilometres at zero loss with liquid nitrogen as a cooling medium . . . This would open exciting perspectives such as the transmission of electric power at zero loss either from large solar cells in the Sahara or from nuclear plants situated at very remote locations, thus contributing to enhanced security."

Obviously, the large number of groups working throughout the world with superconducting oxides will accelerate the development of practical wires. On the other hand, these materials are excessively unstable, being hygroscopic and necessitating complex treatments for an optimization of the superconducting properties.

One of the main reasons for the intense research in this field could be the possibility of electrical power transmission over thousands of kilometres at zero loss with liquid nitrogen as a cooling medium. In order to compete with Cu (1000 A cm^{-2} at 300 K), $YBa_2Cu_3O_{6.7}$ wires should exhibit critical current densities of the order of $> 2 \times 10^5$ A cm^{-2}, the factor > 200 taking into account the difference in price and natural abundance between the raw materials. Such values of J_c may be achieved provided that the pinning behaviour is similar to that of other superconductors and that the grain size can be lowered from > 2 μm, the actually measured dimension. Again, there are similarities with the $PbMo_6S_8$ system.

Besides these estimations, a considerable advantage in using superconductors for this purpose would be the possibility of using dc currents at low voltage instead of the high voltage (up to 750 kV) used today. This would open exciting perspectives such as the transmission of electric power at zero loss either from large solar cells in the Sahara or from nuclear plants situated at very remote locations, thus contributing to enhanced security.

From a paper entitled "Application of advanced superconductors for energy systems — the material aspect" by R. Flükiger (Kernforschungszentrum Karlsruhe, FRG).

The most recent ceramic miracle

The evolution of the applications and fabrication technology of ceramic materials demonstrates the clear interdependency in materials science and engineering of knowledge about structure-property-processing and -performance. The most recent advances in high-performance ceramics and composites have been driven by chemical science. Modern characterization tools have led to understanding of critical features in the composition and structure and have driven new searches for new synthesis and processing routes.

The result of these researches and early commercialization efforts is a plethora of new devices and components which were not possible 25 years ago.

A plethora of new devices and components which were not possible 25 years ago. — Dr H. Kent Bowen.

From the past base of structures synthesized from mineral based components, advanced ceramics, glasses and composites are now formed from purified precursors and with controlled structural features at the nanoscale.

Two of the fastest moving areas of ceramics development are those related to tough, fracture resistant structural ceramics and ceramics used as passive and active electronic and photonic elements. The most recent ceramic miracle is the demonstration of high T_c superconducting properties.

From a paper entitled "Advanced technologies for ceramics" by H. K. Bowen (Massachusetts Institute of Technology, USA).

Mining of asteroids

NASA has made great strides in the exploitation of space over the past three decades, from early missions to demonstrate the capability of man to survive in this new environment, through the successful landings on the moon, to the development of the Space Shuttle. The next logical step in development of a space infrastructure is to build a Space Station in low-Earth orbit to provide a variety of capabilities.

The next step — construction of a space station in low-Earth orbit? (*Photo courtesy NASA*).

Ideas that have been identified by the National Commission on Space in a 1986 report to the President of the United States include colonization of the moon, a manned mission to Mars, and mining of asteroids. These future endeavours will challenge chemists and material scientists of future generations to develop the materials and processes to make such ventures feasible.

From a paper entitled "NASA future plans in space" by William E. Rice (National Aeronautics and Space Administration, USA).

Exploiting geothermal energy

Dick Henley (Bureau of Mineral Resources, Geology & Geophysics, Australia) who presented a paper on application of new materials to the exploitation of geothermal energy: "The use of geothermal energy is dependent on the large-scale transmission of very large quantities of water and steam. Geothermal engineering is therefore dependent upon cost effectiveness and simplicity of design. While small-scale opportunities for new materials applications in such high-stress relatively extreme conditions are plentiful, large-scale uses relate to the development of low-cost materials which minimize the effects of corrosion and scaling or of materials additives which may act as inhibitors."

Optical fibres

Optical fibre technology has entered an era of full practical application after passing through several research and development stages since 1970. As for optical telecommunication in Japan, graded-index optical fibre cables were introduced by NTT into junction networks with digital signals up to 100 Mb s^{-1} between telephone offices. Large-capacity trunk telecommunication networks with 400 Mb s^{-1} digital signals have also been constructed using single-mode optical fibre cables as the advanced stage.

To further optical communication, research is now being concentrated on the following major areas:

1. higher cost performance silica fibres for economical optical subscriber networks,
2. advanced optical communication systems using high-quality silica fibres, such as ultrahigh

capacity optical transmission and coherent optical transmission with a high bit rate of more than 5 Gb s^{-1},
3. future infrared optical fibre transmission having huge long repeater spacings of more than 1000 km.

In addition, research and development on multi-component glass optical fibres and plastic optical fibres is also being conducted to expand the use of their large core diameters, high numerical apertures and easy handling qualities in short-distance optical communication systems. Recent progress on these optical fibre technologies offers great potential for future advanced telecommunication networks.

From a paper entitled "Optical fibres" by Hisao Takata (NTT Electrical Communications Laboratories, Japan).

Dial-a-property materials

Barrie D. Dunn (European Space Agency — ESTEC, The Netherlands) who presented a paper on "Advanced Materials for European Space Agency Spacecraft". In his paper he said that the development of highly sophisticated spacecraft subsystems and electronic equipment has been made possible by many specific breakthroughs in materials and material processing techniques. The "ordinary materials" known and well-proven in aircraft applications are now fabricated by revolutionary processes. New materials such as carbon fibre composites with physical characteristics and failure modes far different to metals are providing a significant challenge. The prospects for new materials are exciting and already new processes enabling "dial-a-property" material characteristics are becoming offered by industry.

"Material requirements for future aero gas turbines" was the topic of a paper presented by Sue Newsam (Rolls Royce, England). She said that the main requirements of high temperature and stiffness for new generation engines for the year 2000 will need new design, material and manufacturing technologies. The most critical areas will be high-temperature ceramics and long-fibre composites.

Automobile materials

The materials mix of automobiles has been changing dramatically over the last decade. Equally significant changes may be expected to occur in the future.

High-strength steel applications will continue to increase based on the economic viability of these materials and the increasingly improved quality of the higher strength levels. A more drastic change in materials will involve the use of structural composites (fibre reinforced plastics). The ultimate use of these materials will depend on the economics which in turn will be dictated by the development of high-speed manufacturing processes.

In engine materials, a wide variety of specialized materials is being investigated including titanium alloys, rapidly solidified aluminum alloys, metal matrix composites, fibre reinforced plastics and ceramics.

Extracted from a paper entitled "Future prospects of automobile materials" by P. Beardmore (Ford Motor Company, USA).

The materials mix of automobiles has been changing dramatically over the last decade.

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Provisional Recommendations

IUPAC seeks your comments

All comments on these recommendations are welcome and will be taken into consideration. The final revised versions are published in *Pure and Applied Chemistry* (*PAC*) and synopses of these published in *CI* as recent reports. If you would like to comment on the provisional recommendations please write to your nearest regional centre requesting a copy of the full report. Copies are not available from the Secretariat. The most up-to-date list of regional centres appeared in *CI*, Vol. 9, No. 1, p. 27 (1987) with additions in *CI*, Vol. 9, No. 3, p. 85, and No. 5, p. 172, 1987.

Nomenclature, symbols, units and their usage in spectrochemical analysis: Part VIII — Nomenclature system for X-ray spectroscopy

This report is one of a series on the nomenclature for spectrochemical analysis issued by IUPAC. It concerns a new notation for X-ray emission lines and absorption edges, to be called *IUPAC Notation*, which replaces the existing Siegbahn notation. It is based upon the energy level designation and has the advantage of being simple and easy to apply to any kind of transition. Moreover, it is consistent with the notations used in electron spectroscopy.

The document first discusses the terms currently used in X-ray spectroscopy and then describes the principles of the IUPAC notation with reference to the X-ray levels and the X-ray transitions. The correspondence between Siegbahn and IUPAC notations for all X-ray lines is given in a table. Finally, the document gives the units and conversion factors used in the X-ray range.

Comments should be sent before 30 April 1988 to Dr C. Sénemaud, Laboratoire de Chimie Physique, 11 rue P. et M. Curie, Université Paris VI, 75231 Paris Cedex 05, France.

Recent Reports

In this section we publish summaries of the most recent IUPAC Recommendations on Nomenclature and Symbols and Technical Reports. The full texts of these recommendations and reports are published in *PAC*.

Nomenclature of tetrapyrroles (Recommendations 1986)

In the revised recommendations two new trivial names (isobacteriochlorin and sirohydrochlorin) are defined. Isobacteriochlorin is 2,3,7,8-tetrahydroporphyrin and is isomeric with bacteriochlorin. An example of an isobacteriochlorin is sirohydrochlorin, an intermediate in the biosynthesis of corrinoids. The names of linear tetrapyrroles are amended. The name bilin is now restricted to the fully oxidized parent, and less oxidized forms are named bilane, bilene, and biladiene. Names are now provided for the analogous dipyrrole system based on the parent dipyrrin. Tables are provided to show the structures of the more commonly encountered compounds using the Fischer system for denoting isomers (the 15 isomers of mesoporphyrin defined by Fischer, and some isomers of biliverdin). Experience has shown that these names continue to be useful because of their brevity.

This report was prepared by the IUPAC and IUB (International union of Biochemistry) Joint Commission on Biochemical Nomenclature and was published in PAC, *Vol. 59, No. 6, pp. 779–832, 1987.*

Nomenclature and symbols for folic acid and related compounds (Recommendations 1986)

The folates are a group of heterocyclic compounds based on the 4-[(pteridin-6-ylmethyl)amino]-benzoic acid skeleton conjugated with one or more L-glutamic acid units. The document is a revision of recommendations prepared by the IUPAC–IUB Commission on Biochemical Nomenclature in

1964. The main changes are a consequence of the much greater information that now exists about the stereochemistry of folates. Recommendations on the nomenclature of reduced compounds and substituents are included, as are proposed symbols and abbreviations.

This report was prepared by the IUPAC–IUB Joint Commission on Biochemical Nomenclature and was published in PAC, *Vol. 59, No. 6, pp. 833–836, 1987.*

Organic analytical reagents in nuclear magnetic resonance spectroscopy

The presence of paramagnetic materials can result in significant chemical shift changes and/or broadening in the NMR spectra of other compounds, both effects resulting from the large magnetic moments of the paramagnetic species. When specific interaction occurs between the paramagnetic additive and the compound under study, much useful information may be obtained. The paramagnetic species of interest are conveniently divided into chemical shift reagents and relaxation reagents. Both classes of reagent are reviewed in this paper, as is also the usefulness of OARs as NMR tagging reagents.

This report was prepared by the Commission on Analytical Reactions and Reagents (V.1) and published in PAC, *Vol. 59, No. 7, pp. 915–926, 1987.*

Interlaboratory trial on the determination of selenium in lyophilized human serum, blood and urine using hydride generation atomic absorption spectrometry

An interlaboratory collaborative study was conducted on the determination of total selenium (Se) with hydride generation atomic absorption spectrometry. Six different materials were investigated, four lyophilized body fluids, an acid-digested body fluid and an acidified aqueous reference solution. The main objective was to find out if accurate values for Se can be obtained with hydride generation atomic absorption spectrometry when an appropriate sample decomposition technique is used. The proposed procedure included a decomposition with nitric, sulphuric and perchloric acids to a final temperature of 310°C in special flasks with long necks. The results obtained by nine laboratories using the proposed decomposition procedure and four laboratories using slight modifications of it show excellent agreement with the values established in previous interlaboratory trials or by experienced laboratories using a number of independent techniques.

This report was prepared by the Commission on Toxicology (VII.4) and published in PAC, *Vol. 59, No. 7, pp. 927–936, 1987.*

PAC Review

Pure and Applied Chemistry (*PAC*) is IUPAC's official journal. It publishes the main invited lectures of symposia sponsored by the Union; the recommendations of its Commissions on nomenclature, symbols and units and technical reports on standardization, recommended procedures, collaborative studies and data compilations. Summaries of the most recent IUPAC recommendations on nomenclature and symbols and technical reports appearing in *PAC* are published in *CI* in the section *Recent Reports*. In this section we take a brief look at the symposia and lectures published in recent issues of *PAC*.

Using biosensors to screen for carcinogens

For three days, from 10 to 12 November 1986, nearly 300 chemists and other scientists from throughout the world gathered in Kyoto, Japan, to participate in the International Symposium on New Sensors and Methods for Environmental Characterization (SMEC).

The symposium reaffirmed that chemical sensors are essential for global monitoring but are as yet insufficient for this purpose. It proposed that a global monitoring system be developed in order to expand the usefulness and applicability of sensors and monitoring systems. The system should include not only chemical indices but also a broad range of biological indicators. These should be based on internationally comparable data and make the fullest possible use of computer aided information and environmental modelling.

The plenary and invited lectures presented at the symposium were published in the April issue of *PAC*, Vol. 59, No. 4, 1987. A paper by Zolotov and others (USSR) described new methods for preconcentration and determination of heavy metals in natural water. Methods included highly selective solvent extraction separation of heavy metals such as silver, copper and mercury, using macrocyclic extractants. The separated elements were determined by atomic absorption spectrometry and spectrophotometry. Zolotov and co-workers have also used heterochain polymer sorbents (poly-

meric thioether and tertiary amines) to concentrate selenium, tellurium, mercury, arsenic, cadmium, lead and other heavy metals. These methods were characterized by high sensitivity and accuracy.

Electrochemical detection in flowing liquids was surveyed by Štulík (Czechoslovakia) in a paper on "Electrochemical flow measurements in environmental analysis". Štulík emphasized ion-selective electrode potentiometry, polarography, voltammetry and coulometry.

Freiser (USA) presented a paper on "Coated wire ion-selective electrodes and their application to environmental problems". He showed that these electrodes are simple, rugged, rapid and reliable sensors for a variety of both inorganic and organic cations and anions. They have been applied to analytical problems of environmental nature such as NOX in ambient air, anionic detergents in water, as well as a wide variety of drugs of abuse and pharmaceutical nitrogen compounds. He also discussed the utility of solvent extraction principles in understanding electrode selectivity and the relevance of polarographic studies of ion transfer between an organic/aqueous interface to ion-selective electrode processes.

Karube and Tamiya (Japan) described various kinds of biosensors they have developed for environmental control. These include a microbial sensor consisting of immobilized yeasts and oxygen probe which they have applied to estimate 5-day BOD. They also constructed an amperometric microbial sensor for ammonia using immobilized nitrifying bacteria and an oxygen probe. Another sensor consisted of aerobic recombinant-deficient bacteria and the oxygen electrode and was applied to the preliminary screening of chemical mutagens and carcinogens. They also described biosensors for nitrite and sulfite ions and methane gas.

Luminescence techniques for detection in HPLC

In the past decade, high-performance liquid chromatography (HPLC) has gained widespread acceptance. Still, the sensitivity and selectivity of detection in HPLC often do not meet the requirements of modern trace-level determinations in biomedical and environmental samples. Among the present-day detection principles, luminescence — and, especially, its best known and most widely applied representative, fluorescence — appears to offer a high potential to achieve (sub)-ppb detection limits for analytes in complex matrices.

Since the range of compounds displaying strong native fluorescence is relatively small, derivatization plays an important role in HPLC with fluorescence detection. Initially, pre-column derivatization (or labelling) was the preferred technique. Today, online post-column derivatization is becoming increasingly popular. Relatively fast reactions such as ion-pair formation with fluorigenic counter ions and true chemical derivatization with, e.g. *o*-phthalaldehyde, especially attract attention. An alternative approach is to use a photochemical reactor. In this case, UV–vis irradiation converts non- or weakly fluorescing analytes of interest into highly fluorescent products.

Laser excitation sources are essential to apply fluorescence detection in miniaturized HPLC. The laser beams are highly collimated, so that illuminated volumes as small as 10 nl are readily attainable. Detector design is crucial because scattered light and background luminescence limit the sensitivity. In the past, continuous lasers have mainly been applied. A recent approach to reduce scatter and to enhance selectivity utilizes two-photon excitation which involves pulsed lasers with high peak power.

The limiting factor in the ultimate detectability of fluorescence is the background light, and its noise, that reaches the photomultiplier. In principle, it would therefore be ideal to be able to eliminate the light source from the detection system. One way to achieve this goal is via chemical excitation or chemiluminescence. Although extensively used in batch analyses, chemiluminescence as a method of detection in HPLC is relatively new. In the literature, most attention is devoted to the peroxyoxalate system, which has successfully been used to determine various types of fluorophores, fluorophore-labelled compounds as well as hydrogen peroxide.

According to Brinkman, de Jong and Gooijer in a paper on "Use of luminescence techniques for sensitive and selective determinations in HPLC" the use of luminescence techniques for detection in HPLC has high potential. These techniques are especially useful when extremely high sensitivity and/or selectivity are required, and they can be nicely adapted to the demands of miniaturized HPLC. Three aspects were discussed in their paper: (i) online post-column derivatization in HPLC with conventional fluorescence detection; (ii) the state-of-the-art of laser fluorescence detection for HPLC; (iii) the principles and applications of online chemiluminescence (peroxyoxalate system) detection in HPLC.

Their paper was one of the plenary lectures presented at the 2nd International Symposium on Quantitative Luminescence Spectrometry in Biomedical Sciences held in Ghent, Belgium, 11–14 May this year. The lectures were published in the May issue of *PAC*, Vol. 59, No. 5, 1987.

Stages of a research project

The following six stages of a research project were defined at the IUPAC Executive Committee meeting held in Vesprem, Hungary earlier this year:

1. wild enthusiasm
2. general confusion
3. total disappointment
4. hunt for the guilty
5. punishment of innocents
6. promotion of non-participants.

Water chemistry proceedings

A limited number of copies of the *Proceedings* of the Commission on Water Chemistry Workshop on "Removal of Chlorinated Hydrocarbons and Heavy Metals from Wastewaters by Advanced Treatment Systems" are available free of charge from the IUPAC Secretariat. The workshop was held in Frankfurt, FRG, 15–16 October 1986 (see *CI*, Vol. 9, No. 5, p. 179, 1987). *To obtain a copy please write to: The Information Officer, IUPAC Secretariat, Bank Court Chambers, 2–3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK.*

Time warp

One observant reader of these pages has noticed the remarkable ability of the editor of *CI* to take photographs of meetings before they actually occur! In the July issue this year (p. 145) we published a photograph of a meeting of the Applied Chemistry Division Committee which will (?) take place in London, December 1987 but actually took place in December 1986. Sorry about the confusion. Yet another inadvertent *CI* error for the *ad hoc* Committee (see *CI*, p. 15, December 1986).

Considerable interest in Affiliate Membership Scheme

Participants at the 6th International Conference on Boron Chemistry showed considerable interest in the IUPAC Affiliate Membership Scheme, according to Professor Norman Greenwood, Official Representative at the Conference. Several participants also showed interest in the new edition of the Red Book on Inorganic Nomenclature (see *CI*, pp. 191–4, September 1987).

The conference, which included lectures by two Nobel Laureates, was held at Castle Bechyne, near Tabor, Czechoslovakia from 22 to 26 June 1987.

IUPAC Accounts for 1986

This is the second publication of the IUPAC accounts audited annually. They are preceded by the Biennial Report of the Treasurer (1985/86) presented at the 34th IUPAC General Assembly held in Boston, USA in August.

This is the second publication of accounts audited annually. The accounts for 1985 are given in *CI*, Vol. 8, No. 6, pp. 29–34, 1986. As pointed out previously, the accounts are not easy reading, but the figures do inform everyone about income and expenditure. For various reasons the figures are not in close agreement with the budget, approved by Council in 1985. However, the invoiced subscriptions were based on the budget.

Before studying the accounts it is recommended to read my report below for the biennium 1985/1986. In addition, I have only one remark: some outstanding items of subscription income may not be received fully. The Finance Committee has estimated the prospective loss of income and entered it as a "bad debt" provision. However, no loss will occur until the Officers decide that some monies shall actually be written off.

Biennial Report of the Treasurer

My second biennium as Treasurer has seen an improvement in the financial status of IUPAC, although this has not decreased the workload nor made life simpler. (It is easier to say "no"!) The need for improving financial planning and administration is even greater and new activities are an additional call on funding. Furthermore, the Treasurer is to be the guarantor to the Bureau and Council that expenditures are authorized and accounts maintained.

Anders Björkman. — My second biennium as Treasurer has seen an improvement in the financial status of IUPAC.

The "natural law" of IUPAC, mentioned in my previous report, is still effective. There has been a considerable excess of income over expenditure during the past biennium (US $):

	Accounts	Budget
1985	224 271	94 000
1986	198 145	122 000
Total	422 416	216 000

The main *accounting* interpretations of this situation are (figures published with the 1985 accounts in *CI* 1985, No. 6, p. 29 being included):

- an increase in national subscriptions received (the total subscriptions obtained for a particular year are not known until later),
- higher interests and dividends (mainly as a profit by measures taken to "hedge" the sinking US dollar and currency effects),
- increased royalties from publications, reduced somewhat by an unbudgeted subsidy for *CI* and the *IUPAC Handbook* supplement thereto,
- somewhat lower expenditure on Lyon General Assembly.

It is satisfying to note that the IUPAC policy on selecting as its new main official publisher, Blackwell Scientific Publications, and the work of the Committee on Publications together with the Secretariat, has produced substantially increased income.

The biennial spending of IUPAC bodies in 1986/7 is not known until the end of 1987, but in view of the improved income, the Officers decided in 1986 to make *supplementary allocations* to the Divisions and to invest in the finalization of a *Compendium of IUPAC Terminology*.

As decided in Lyon the Officers have supported the creation of the *Committee on Chemical Databases* with non-budget money (more to be given). Furthermore, the Officers decided to invest in 1986 some money to improve the Secretariat's word processing system, this expenditure being counteracted by lower Secretariat costs in US dollars in 1985.

A better conformity has been reached in wording between the items in the accounts and those in the budgets. Moreover, from 1986 onwards there are and will be *separate statements* of income and expenditure for the CHEMRAWN Committee (Rolling Fund) and the Affiliate Membership Scheme (AMS).

The budget work on AMS at Lyon in 1985 was hampered by uncertainties. The funds acquired separately for AMS were consumed in 1986 and an additional US $4 375 had to be provided from the general purposes account. The future financial aspects of AMS come forth in the budgets for 1988 and 1989.

Table

	Yen/$ (ICSU) standard)	Assets		Interest & dividends		Total income		Estimated assets above minimum	
		$	Yen	$	Yen	$	Yen	$	Yen
1984	250	100	100	100	100	100	100	100	100
1985	200	113	90	95	76	120	96	146	117
1986	160	176	93	1452	91	122	78	259	166

The need for *space enlargement* of the Secretariat has been under consideration, amongst others by an *ad hoc* committee. An interim solution has been found and the financial implications of the matter will be included in the next biennial report.

The total of US $422 416, obtained as excess of income over expenditure, has entered into *assets*, which (end of 1986) are slightly over US $2M, i.e., well above the guideline minimum of the total expenditures of the last two years. Two comments are warranted:

1. The assets do yield considerable income.
2. The US $ figure is high because of the lower currency level.

The second item may be illustrated by expressing some financial key figures at the end of 1984, 1985 and 1986 in dollars and yen, using the actual exchange rates and with the figures normalized to 1984 (as being set to 100) (see Table above). Undoubtedly, the assets are in a favourable state.

A genuine *financial policy* for the maintenance of assets has never been decided. As Treasurer I would like to propose that:

1. Budgets are designed to take care of approved activities through the normal sources of income. Any reduction of NAO subscriptions by the use of assets is not to be conceded.
2. If assets tend to decrease below the guideline minimum, a counteracting transfer to assets is included in the budgets (in effect, a planned excess of income over expenditure in a biennium).
3. If assets tend to become (well) above the guideline minimum, budgets are balanced to avoid further growth.
4. If assets continue to stay well above the guideline minimum, the Finance Committee may suggest the release of some assets for investment in once-only expenditures, e.g. establishment of a database or a much needed administrative improvement (in effect, a planned excess of expenditure over income in a biennium).

The transition from the previous national category subscription system to the *Leuven/Lyngby/Lyon subscription scheme* — as outlined in my previous report — has been a problem for several NAOs and has required many negotiations. We are now very close to a settlement in all cases. The policy, advocated by me and accepted by the Officers, has been to have patience and allow some countries to pay reduced subscriptions (in essence a prolongation of the category system) for a few years, provided that a plan was presented for full acceptance of the L/L/L scheme. A couple of countries were lost, but Brazil has announced interest in rejoining IUPAC under the new subscription scheme.

A *new budgeting procedure* for the Divisions, already announced in Lyon, has been developed in consultation with the Division Presidents and is accepted by the Officers and Bureau. It is now being put to trial in preparing the budget proposals for 1988 and 1989. Instead of the previous procedure of deciding in Council the total funds given to Standing Committees and Divisions, whereafter the Officers allocated this money to the various bodies, the Divisions are now asked to present their activity plans about eight months before a General Assembly. By correspondence the Treasurer may ask for modifications and more information. He then suggests a level of funding to take care of the resulting figures in the biennial budget proposal, worked out in conjunction with the Finance Committee and Secretariat. Subsequently, the Officers study the entire material and make a preallocation. The budgets are finalized at the General Assembly.

After the budgets are approved by Council, the Officers will make the final allocation, using the integral information procured.

Steps are being taken to consider a reconstruction of the organizational structure of IUPAC. In my opinion special attention should be directed to improvements in the budgeting and allocation systems to secure a maximization of the scientific and applied utilization of IUPAC's financial resources by active involvement of the best available experts and provision of pertinent flexibility.

Reconfirming the liability of IUPAC to support the CHEMRAWN Conferences and recognizing the financial risk which may be encountered, the Offi-

An important item for the future is to elicit full advantage from the Secretariat computers.

cers have made the Treasurer an ex officio Member of the CHEMRAWN Committee (without voting power), asking me to draft a statement with regard to implementation of my responsibilities in these Conferences, to be considered by the CHEMRAWN Committee and approved by Bureau for presentation to Council at Boston. My proposal has been modified by the Committee and is being prepared for the Boston Assembly.

As indicated above, the General Assembly in Lyon was accomplished with some saving on the budget (US $10 500), but the Secretariat (with the Treasurer involved) had difficulties correcting some irregularities. The Boston Assembly also uses student facilities but the overall budget (US $450 000) may be slightly exceeded. It is fortunate with the "weak" US dollar, that the Assembly is being held in Boston.

After the national subscription settlements and the introduction of the new budget procedure, another important task for the Treasurer and Secretariat will be to develop some *improvements in control of income, expenditures and accounting*. On my proposal the previous President, Dr W. G. Schneider, made a ruling, which simplifies authorization of claim forms, etc. The audit of accounts (in Zürich and Oxford) is now being done each year, as proposed by the Finance Committee and approved by the Officers, but is made in agreement with the Statutes. This means, in effect, that every expenditure must bear the signature of myself or of the Executive Secretary (as delegated to him). We do have complete confidence in each other, but nevertheless I shall have to finalize some rules for "internal audit", which will confirm my pursuit of the statutory responsibility of the Treasurer to the Bureau and Council.

Moreover, an important item for the future is to elicit full advantage from the Secretariat computers, so far used mainly for word processing and information storage and retrieval. The goal is to contrive an *"IUPAC management accounting"*, which will yield relevant service to everyone involved and save time for the Secretariat in favour of other important functions of the staff. To this end a suitable consultant must be employed. I am convinced it is worth the effort and expense, even if it may not be clearly substantiated. The main issue is to define clearly what we wish the computer to do.

Finally, I wish to express my sincere gratitude for the support of many IUPAC people with whom I have had the privilege to work. Here I can only indicate the persons with whom I have had frequent close contacts: my fellow IUPAC Officers, the leading members of the Secretariat staff, our accountant (Mr Th. Fehr) at the Union Bank of Switzerland, the Finance Committee, the CHEMRAWN Committee, Members of the Bureau and, last but not least, the Division Presidents. They have provided me with much stimulus, mixed occasionally with harsh problems!

Anders Björkman
Treasurer

Auditors' Report

As auditors of the International Union of Pure and Applied Chemistry we have examined the accounts for the year ended 31 December 1986 in accordance with the provisions of Swiss law.

We have come to the conclusion that:

- the balance sheet and statement of income and expenses are in agreement with the books,
- the books of account have been properly kept,
- the financial position and the result of operations are presented in accordance with the principles of evaluation prescribed by Swiss law and the requirements of the statutes.

As a result of our examination we recommend that the accounts submitted to you be approved.

NEUTRA TREUHAND AG

Erratum

The 1985 accounts (*CI*, Vol. 8, No. 6, p. 30, 1986) contain an error. Under **Assets**: *Subscriptions, etc. Outstanding* the US-$50.00 should apply to Observer Countries Serv. Charges and the US-$700.00 to Company Associate Serv. Charges.

Balance Sheet for 1986 (expressed in US dollars)

Assets		
Cash in Banks		
US Dollars	24 669.74	
Sterling	37 681.00	
Swiss Francs	4 578.00	
German Marks	7 073.00	
Money Market Investments	562 421.00	636 422.74
Marketable Securities at Cost		1 410 363.34
Accounts Receivable[a]		16 037.57
Subscriptions, etc. Outstanding[b]		
National Organizations	100 589.50	
Company Assoc. Service Charges	1 700.00	
Observer Countries Serv. Charges	200.00	103 489.50
		2 166 313.15

Liabilities		
Capital Account		1 575 694.75
Accounts Payable[c]		7 525.00
Provisions		
Committed Expenditure	138 000.00	
Bad Debts[d]	83 403.00	
CHEMRAWN Rolling Fund[e]	45 174.21	
Sol. Data Ser.	3 672.68	
Seminars, IVPs[f]	4 500.00	
History of IUPAC[g]	20 000.00	294 749.89
Excess of Income over Expenditure	198 145.22	
Deprec./Profit on Sold Securities and Swap	90 198.29	288 343.51
		2 166 313.15

Notes for 1986 Balance Sheet

(a) *Accounts Receivable*

Swiss Computation Tax Recoverable		204.00
Publications Blackwell		15 833.57
		16 037.57

(b) *Subscriptions, etc. Outstanding*

National Organizations (1983)		
Austria	2 200.00	
Yugoslavia	1 789.50	3 989.50
National Organizations (1984)		
Australia	9 100	
Austria	4 300	
Iraq	2 500	
Syria	1 250	
Yugoslavia	2 500	19 650.00
National Organizations (1985)		
Australia	3 200	
Austria	4 100	
Belgium	8 500	
Iraq	2 500	
Poland	7 700	
Syria	1 250	
Yugoslavia	2 500	29 750.00
National Organizations (1986)		
Egypt	2 700	
Austria	1 500	
Belgium	10 300	
Cuba	650	
CSSR	350	
Greece	1 350	
Iraq	2 500	
Malaysia	650	
Peru	650	
Romania	8 600	
Spain	12 400	
Syria	1 350	
Turkey	2 500	
Yugoslavia	2 700	48 200.00
Service Charges Company Assoc. (1985)		
UK		650.00
Service Charges Company Assoc. (1986)		
Egypt	75	
Argentina	25	
CSSR	25	
France	200	
Greece	25	
UK	700	1 050.00
Service Charges Obs. Countries (1986)		
Kuwait	50	
Malawi	50	
Nepal	50	
Philippines	50	200.00
		103 489.50

(c) *Accounts Payable* (advance payments)

Chile	600.00
Canada	6 900.00
Irish Company Assoc.	25.00
	7 525.00

(d) From the 73 103 in 1985, 19 700 were used to write off, and provision raised with 30 000 (cf., General Income and Expenditure Statement).

(e) See CHEMRAWN Income and Expenditure Statement

(f) IUPAC Visiting Professorships.

(g) Subsidy towards publication.

Statement of General Income and Expenditure for Year ended 31 December 1986 (expressed in US dollars)

Expenditure			Income		
Office Expenses			*National Subscriptions*		
IUPAC Officers	3 494.93		Received	380 443.34	
IUPAC Secretariat (non-publ.)	164 759.00		Outstanding	48 200.00	428 643.34
Audit, Bank Fees, Other Charges	25 232.35	193 186.28			
Expenses IUPAC Bodies			*Company Associates Service Charges*		
Administration Expenses	12 105.62		Received	4 650.00	
Meetings other than Gen. Assembly	176 616.60		Outstanding	1 050.00	5 700.00
General Assembly	3 019.00	191 741.22			
Symposia, Seminars, IVPs		7 500.00	*Observer Countries Service Charges*		
			Received	550.00	
Bad Debts Write Off		19 700.00	Outstanding	200.00	750.00
			Interest and Dividends Earned		162 484.27
Provisions Made			*Subvention/Grants from ICSU*		24 705.00
Committed Expenditure[a]	138 000.00				
Bad Debts[b]	30 000.00		*Transfer from Publications Account*		176 931.72
Seminars, IVPs	4 500.00				
History of IUPAC	20 000.00	192 500.00	*Withdrawals from Provisions*		
			Committed Expenditure[e]	5 964.00	
Other Expenses			Bad debts	19 700.00	
Compendium IUPAC Terminology	11 416.00		Compendium IUPAC Terminology	7 843.00	33 507.00
Affiliate Membership Scheme[b]	4 374.72				
ICSU Grant	3 000.00		*Foreign Exchange Differences*[c]		1 033.61
UNESCO Contracts	3 000.00				
Contributions to ICSU	10 793.50		*Other Income*		
Miscellaneous Expenses	3 098.00	35 682.22	UNESCO Contracts	3 000.00	
			COSTED for IVPs	2 000.00	5 000.00
Excess of Income over Expenditure		198 145.22			
		838 754.94			838 754.94

Notes for Statement of General Income and Expenditure for Year ended 31 December 1986

(a) Remaining Divisional funds allocated for 1985–6.
(b) Cf. AMS Income and Expenditure Statement.
(c) Because of currency fluctuations there is a gain (or loss) with UK pounds, Swiss francs and German marks relative to the US dollar used for accounting.

Statement of Publications Income and Expenditure for Year ended 31 December 1986 (expressed in US-dollars)

Expenditure			Income		
IUPAC Secretariat (publ.)		93 570.00	*Publications*		
Chem. Intl. & Membership Lists		25 000.00	Blackwell	254 760.45	
Sol. Data Ser.			Pergamon	26 159.86	
Expended	6 326.32		Other Publishers	10 568.07	
Provision made	3 672.68	9 999.00	Secretariat	409.00	291 897.38
Miscellaneous Expenditure		7 349.66	*Support of Publication Activities by Blackwell and Pergamon*		13 000.00
Transfer to General Income and Expenditure Statement		176 931.72	*Comp. Assoc. Special Unit*		900.00
			Sol. Data Ser.		
			Last Year's Provision	6 000.00	
			Income	1 000.00	7 000.00
			Miscellaneous Income		53.00
		312 850.38			312 850.38

Statement of CHEMRAWN Income and Expenditure for Year ended 31 December 1986 (expressed in US-dollars)

Expenditure		Income	
CHEMRAWN III Deficit	13 839.93	*CHEMRAWN II Surplus*	28 757.10
Chemical Plant Safety Workshop	3 567.00	*Pergamon Royalty*	741.00
Committee Meeting Heidelberg	757.00		29 498.10
Transfer to CHEMRAWN Rolling Fund[a]	11 334.17		
	29 498.10		

Note

(a) The 11 334.17 increased the Fund from 33 840.04 to 45 17421 (see Balance Sheet).

Statement of AMS Income and Expenditure for Year ended 31 December 1986 (expressed in US-dollars)

Expenditure		Income	
Salaries	14 833.00	*Contributions*	42 460.75
Share Secretariat Cost	7 997.00	*Transfer from Provisions for Affil. Activities*[a]	16 911.22
Miscellaneous Expenses	10 798.03	*Transfer from General Income and Expenditure Statement*	4 374.69
Che. Int. & Leaflets	30 118.66		63 746.69
	63 746.69		

Note

(a) Remaining non-IUPAC grants.

Securities Account Statement as at 31 December 1986

		Approx. Price	Approx. Value, US $	Book Value at Cost, US $		Profit/Loss this Year, US $
a Bonds						
6.625% Eurofima 1985–14.2.92	Yen 5 000 000	104.875%	32 891	28 661.00	+	4 230.00
7.50% Germany 20.4.89	DM 400 000	102.25%	211 862	153 062.00	+	44 678.00
6.75% Europ. Investment Bank 22.8.97	DM 70 000	101.90%	36 769	30 937.00	+	5 832.00
11% BASF 1982–1.3.88	US $ 100 000	103.75%	103 750	99 721.39	–	500.00
7% B.P. 1985–14.3.92	Yen 5 000 000	106.625%	33 439	29 468.00	+	3 971.00
11.75% Nat. Westminster 1982–1.11.92	US $ 100 000	118.25%	118 250	99 230.17	+	8 500.00
10.50% Bayer 1982–16.6.87 ex.	US $ 250 000	102%	255 000	248 016.88	+	2 500.00
10.375% Citicorp 1983–11.5.90	US $ 100 000	101%	101 000	92 391.27	–	3 875.00
15.75% Pacific Gas 1982–15.1.89	(US $ 50 000)				+	21.00
9.625% Dow Chem. 1979–1.3.94	(US $ 60 000)				+	2 441.17
7.75% Volkswagen 1977–15.5.87	US $ 40 000	100.25%	40 100	40 254.98	+	1 000.00
8.75% Olivetti 1985–15.4.93	ECU 60 000	103%	66 009	51 785.00	+	13 559.00
9% Philips 1985–30.5.93	ECU 75 000	103.50%	82 912	67 495.00	+	14 424.00
8.25% Beecham Int. Bermuda 1971–86	(US $ 24 000)				–	30.00
6.75% Dow Chem. 1985–24.10.95	DM 100 000	103%	53 094	44 372.00	+	8 722.00
11.25% Morgan 1985–28.2.92	US $ 100 000	109.25%	109 250	99 165.70	+	2 875.00
6.50% Philip Morris 1986–14.2.91	Yen 5 000 000	103.25%	32 381	28 295.00	+	4 086.00
11.375% Connecticut Savings 26.2.90	US $ 60 000	107%	64 200	60 560.17	+	2 400.00
	Sub-total Bonds		1 340 907	1 173 415.56	+	114 834.37
b Shares						
shs Fidelity Magellan Fund	5 411	US $48.69	263 471	236 947.78	+	2 668.37
	Sub-total Shares		263 471	236 947.78	+	2 668.37
	Total		1 604 378	1 410 363.34	+	117 502.74

Conference Calendar

Conference circulars and registration forms for the IUPAC-sponsored conferences listed below may be obtained, upon request, from the names and addresses shown in parentheses.

1988

Drugs in Competitive Athletics

29 May–1 June. First International Symposium on Drugs in Competitive Athletics. Islands Brioni, Yugloslavia.
(Prof. Mirna Mikac-Devic, Institut of Clinical Chemistry, Medical High School, Hospital "Dr. M. Stojanovic", Vinogradska 29, 41000 Zagreb, Yugoslavia.)

Natural Products

29 May–4 June. 16th International Symposium on the Chemistry of Natural Products. Kyoto, Japan.
(Prof. Isao Kitagawa, General Secretary, 16th International Symposium on the Chemistry of Natural Products, c/o The Chemical Society of Japan, 1–5, Kanda-Surugadai, Chiyoda-ku, Tokyo 101, Japan.)

Prof. Shô Itô (IUPAC Bureau member from Japan), Chairman of the Organizing Committee of 16th International Symposium on Chemistry of Natural Products to be held in Tokyo, Japan in 1988 and a recent visitor to IUPAC Secretariat.

Organic Synthesis

4–7 July. 7th International Conference on Organic Synthesis. Nancy, France.
(Prof. P. Caubère, Université Nancy 1 — Faculté des Sciences, Laboratoire de Chimie Organique 1, BP 239, 54506 Vandoeuvre-lès-Nancy Cédex, France.)

Modified Polymers

5–8 July. 7th Bratislava International Conference on Modified Polymers. Bratislava, Czechoslovakia.
(Dr A. Romanov, Polymer Institute CCR of the Slovak Academy of Sciences, 842 36 Bratislava, Czechoslovakia.)

Macromolecules

11–14 July. 11th Discussion Conference on Macromolecules: Chemical and physical phenomena in the ageing of polymers. Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského námestí 2, CS-16206 Prague 6-Petriny, Czechoslovakia.)

Photochemistry

17–23 July. 12th International Symposium on Photochemistry. Bologna, Italy.
(Prof. V. Balzani, Dipartimento di Chimica, Università degli Studi, Via Selmi 2, 40126 Bologna, Italy.)

Poly(Vinyl Chloride)

18–21 July. 31st Microsymposium on Macromolecules: Poly(Vinyl Chloride). Prague, Czechoslovakia.
(Dr P. Čefelín, Scientific Secretary, P.M.M. Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, Heyrovského, námestí 2, CS-177206 Prague 6-Petriny, Czechoslovakia.)

Macromolecules

1–6 August. 32nd International Symposium on Macromolecules. Kyoto, Japan.
(Prof. Takeo Saegusa, Department of Synthetic Chemistry, Faculty of Engineering, Kyoto University, Yoshidi-machi, Sakyo-ku, Kyoto 606, Japan.)

Inorganic Ring Systems

8–12 August. 5th International Symposium on Inorganic Ring Systems. Amherst, Mass., USA.
(Prof. R. R. Holmes, Department of Chemistry, University of Massachusetts, Amherst, MA 01003, USA.)

Solution Chemistry

15–18 August. 19th International Conference on Solution Chemistry. Lund, Sweden.
(Prof. Sten Ahrland, Inorganic Chemistry 1, Chemical Center, University of Lund, PO Box 124, S-221 00 Lund, Sweden.)

Mycotoxins and Phycotoxins

16–19 August. 7th International

Symposium on Mycotoxins and Phycotoxins. Tokyo, Japan.
(Prof. Shinsaku Nator, Maiji College of Pharmacy, 1-22-1, Tanashi-shi, Tokyo, Japan.)

Physical Organic Chemistry

21–27 August. 9th International Conference on Physical Organic Chemistry. Regensburg, Federal Republic of Germany.
(Prof. J. Sauer, University of Regensburg, Institut für Organische Chemie, Universitätsstr. 31, D-8400 Regensburg, Federal Republic of Germany.)

Solubility Phenomena

23–26 August. 3rd International Symposium on Solubility Phenomena. Guildford, Surrey, UK.
(Dr Angela F. Danil de Namor, Department of Chemistry, University of Surrey, Guildford, Surrey GU2 5XH, UK.)

Chemical Thermodynamics

29 August–2 September. 10th Conference on Chemical Thermodynamics. Prague, Czechoslovakia.
(Prof. R. Holub, Department of Physical Chemistry, Institute of Chemical Technology, 166 28 Prague 6, Czechoslovakia.)

Coordination Chemistry

29 August–2 September. 26th International Conference on Coordination Chemistry. Porto, Portugal.
(Prof. J. de O. Cabral, Department of Chemistry, Faculdade de Ciencias, 4000 Porto, Portugal.)

Molecules and Molecular Crystals

29 August–3 September. International Symposium on the Electronic Structure and Properties of Molecules and Molecular Crystals. Cavtat-Dubrovnik, Yugoslavia.
(Prof. Z. B. Maksic, Ruder Boskovic Institute, 41001 Zagreb, Bijenicka 54, Croatia, Yugoslavia.)

Organometallic Chemistry

4–9 September. 13th International Conference on Organometallic Chemistry. Turin, Italy.
(Prof. Luciano Milone, Istituto di Chimica Generale ed Inorganica, Facoltà di Farmacia, Università di Torino, Via P. Giuria 9, I-10125 Turin, Italy).

Raman Spectroscopy

5–9 September. Eleventh International Conference on Raman Spectroscopy, London, UK.
(Prof. R. J. H. Clark, Department of Chemistry, University College London, 20 Gordon Street, London WC1H 0AJ, UK.)

1989

Analytical Chemistry

30 July–5 August. SAC 89: International Conference on Analytical Chemistry. Cambridge, UK.
(Dr J. D. R. Thomas, Applied Chemistry Department, UWIST, PO Box 13, Cardiff CF1 3XF, UK.)

IUPAC Congress

2–7 August. 32nd International Congress of Pure and Applied Chemistry. Stockholm, Sweden.
(IUPAC, c/o Stockholm Convention Bureau, PO Box 6911, S-102 38 Stockholm, Sweden.)

Novel Aromatic Compounds

20–25 August. 6th International Symposium on Novel Aromatic Compounds. Tonaka, Osaka, Japan.
(Prof. Ichiro Murata, Department of Chemistry, Faculty of Science, Osaka University, Toyonaka, Osaka 560, Japan.)

1990

Organic Synthesis

23–27 July. 8th International Conference on Organic Synthesis. Helsinki, Finland.
(Prof. Tapio Hase, Department of Chemistry, University of Helsinki, Vuorikatu 20, SF-00100 Helsinki, Finland.)

Pesticide Chemistry

5–11 August. 7th International Congress of Pesticide Chemistry. Hamburg, Federal Republic of Germany.
(Gesellschaft Deutscher Chemiker, Abt. Tagungen, PO Box 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany.)

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